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JAMES P. PORTER, *Editor*
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CARL IVER HOVLAND AND E. F. WONDERLIC. Prediction of Industrial Success from a Standardized Interview

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Athens, Ohio

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PREDICTION OF INDUSTRIAL SUCCESS FROM A STANDARDIZED INTERVIEW[1]

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and
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INTRODUCTION

THE notorious inadequacy of the traditional interview has given rise to improvement in two directions: First, in the development of standardized interviews in which the questions to be asked are carefully prepared in advance; and secondly, in the use during the interview of rating scales to permit more precise evaluations of various personal traits which are not otherwise amenable to measurement. Discussion of these procedures will be found in Bingham and Moore (1). Both have shown considerable promise, but both have limited usefulness. The present study reports an instrument which has been developed to utilize both of these techniques in a single form. This instrument, called the Diagnostic Interviewer's Guide,[2] provides for the obtaining of the necessary information concerning the applicant in a standardized interview and in addition permits a rating by the interviewer of the present capabilities and future potentialities of the applicant as judged by his responses to the questions asked in the interview.

[1] The assistance of Dr. S. N. Stevens in the development of the Diagnostic Interviewer's Guide is gratefully acknowledged. The writers also wish to thank Professor E. L. Clark for critical reading of the manuscript.

[2] Available through the Psychological Corporation, 522 Fifth Avenue, New York City.

The Diagnostic Interviewer's Guide (hereafter abbreviated D.I.G.) was developed as a part of the selection program of Household Finance Corporation, a large personal loan organization. The positions for which applications were received were principally those of outside representatives doing public contact work. Interviewing for employment in this company is done not only by the Personnel Department at headquarters but by branch managers and supervisors throughout the company. This type of administrative organization suggested the desirability of an interview method which would require a short time for administration and could be used by interviewers with relatively little training. A standardized interview combined with a system for quantitative recording of the rating of the applicant by the interviewer was developed to meet this need. The other instruments used in the selection procedure, for measuring mental ability, personality, interests and attitudes, will be described elsewhere (*e.g.*).

DESCRIPTION OF THE D.I.G. BLANK

The general construction and lay-out of the D.I.G. blank can be seen from the accompanying illustration (Figure 1) showing the first page of a completely filled-in form. Four pages of questions cover four general areas of the applicants' background and personal characteristics: (1) Work history, (2) Family history, (3) Social history and (4) Personal history. It will be observed that at the top of each section there are a series of standardized questions which the interviewer asks the applicant. At the bottom are questions which the interviewer asks himself concerning the applicant. The latter questions provide a method of rating the applicant. The answers are scored plus or minus depending on whether they are prognostic of success or failure on the job.

The type of information obtained in the four sections may be briefly summarized:

Work History: The questions in this section are designed to aid the interviewer in determining whether or not the individual

(+18)

DIAGNOSTIC INTERVIEWER'S GUIDE

NAME Harry R. Johns DATE 8/25/37

ADDRESS 812 Cherry St. INTERVIEWER E.F.J.

The interviewer should begin each interview with this statement to himself, "This applicant will impress me according to my past experience with persons who remind me of him. Consequently I must be on my guard against such prejudices which may naturally arise on account of this. I must keep a record of the fact and judge the applicant on the basis of the facts only. The applicant is a blank to me now." (Interviewer should write out information received as answers to the questions in the space left for that purpose.) If extra space is needed use separate sheets of paper. All of this material should be included with the blank itself when returned to the personnel department. The questions which are listed below for the interviewer to ask the applicant are suggestive. Other queries pertinent to the applicant's history will naturally suggest themselves to the interviewer as he contacts the applicant.

Please read special instructions on last page before interviewing.

WORK HISTORY:

Interviewer says—

1. "Give me the names of your past employers. Begin with the last or present employer and go backward. Tell me:
   (a) How you got the job,
   (b) What you did, and,
   (c) Why you left.

Smith Hardware Co. Job through uncle. 3 mo.- stillers Counter clerk & delivery boy

Waited on tables while working my thru college

2. How did your previous employers treat you? fine – no complaints

3. What experience of value did you get from each job? meeting people

4. Did you do work of such quality that your employer would be glad to recommend you? yes – Expecting a raise

5. Were you ever criticized for the kind of work you did? Give me some examples of mistakes or failures.

Once for wasting too much time talking with customs

6. Can you give me any example of success in your experience, particularly in handling people?

Sold large order of goods to hard-to-sell customs during spare time. $5.00 extra commission

Edited school paper cleared $1,500.00

7. What kind of work did you enjoy the most and seem to progress the best in?—
   ✓(a) Mechanical work?
   (b) Clerical and detail work?
   ✓(c) Contact work?
   or (d) Do you know?

(+4 −4)

When the interviewer has secured as much information as it is possible for him to get concerning every phase of the applicant's work history, he should ask himself the following questions:

1. What kind of work history does the applicant have? (−) Poor — Fair ‡ Good — Excellent (+)
2. Has it been the type of work which has required meeting and handling different types of people? (+) Yes ‡ No (−).
3. Has the applicant indicated ability to work consistently? (+) Yes ‡ No (−)
4. Has the applicant indicated a serious and sincere attitude toward the work he has been doing? (+) Yes ‡ No (−).
5. Has the work been such as to necessitate the development of habits of persistence and aggressiveness? (+) Yes ‡ No (−)
6. Has the work history indicated a capacity for growth? (+) Yes ‡ No (−).
7. Does the work history reveal habits or attitudes which would make it easy for the applicant to adjust himself to the policies and procedures of this company? (+) Yes ‡ No (−).
8. Is this man a good soldier as evidenced by good team-work? (+) Yes ‡ No (−).

has shown the capacity to grow and develop in the work which he has previously done. Information is sought concerning the applicant's ability to analyze critically the tasks assigned to him and to profit by his work experience.

Family History: The interviewer here asks questions to reveal whether or not the applicant's training and family background,

in terms of social, economic and educational advantages, have been such as to develop traits of personality and character which are desirable from the standpoint of success on the job for which he is applying.

Social History: Information is obtained concerning the character of the applicant's social interests. The questions seek primarily to analyze the avocational life of the applicant, but also try to determine the individual's sociability and interest in people. This section is of considerable value in supplementing the information obtained from personality tests.

Personal History: The items in this section help to discover the motivational factors in the applicant's make-up. Is the applicant ambitious? Is he capable of hard, continuous work? Does he have a well thought-out goal? These are some of the things that the interviewer can determine on the basis of this section of the Guide.

SCORING

At the end of each division, at the bottom of the page, are the questions which the interviewer must ask himself concerning the ability and qualifications of the applicant. The answers which the applicant gives to the questions put to him are the basis on which judgments are made. From the interviewer's judgments the quantitative score is obtained. The questions are worded to control as much as possible the interviewer's subjective opinions and impressions.

In scoring the blank, the (+) or (−) is encircled next to the words, "Yes" or "No" at the end of each question on the bottom of the page. For example, in question 2 on the sample page:

> 2. Has it [the applicant's previous work] been the type of work which has required meeting and handling different types of people? (+) Yes—No (−).

If the interviewer believes the answer is "Yes," the (+) next to the word "Yes" is encircled. If the interviewer feels that he should encircle the word "No," the result would be a nega-

tive value for this item. All items are checked in this manner. The plus or minus values were determined on the basis of whether the answers were favorably or unfavorably related to success on the job. Thus, some of the "No" answers carry a positive rating, *e.g.*, Page 3, Question 4:

4. Is he [the applicant] careless on money matters or too heavily in debt? (–) Yes—No (+).

The total score for the interview is the algebraic sum of the plus and minus reactions on the eight items of Work History, five items of Family History, twelve items of Social History, and nine items of Personal History. The maximum score which can be obtained is + 34, the minimum – 34. The nature of the scoring is such that all scores are even numbers (*i.e.*, multiples of two).[3]

The questions on the bottom of each page cannot be answered entirely on the basis of the answers to the formal questions above. On the last page, for example, a question is asked concerning the applicant's frankness. This can be answered solely on the basis of the subjective impression of the interviewer. During the interview a number of reactions which cannot be recorded may hint that the applicant is not completely frank throughout, and consequently, he will be given a (–) score on this item. When a negative answer is given, the interviewer is advised to get additional information on this point, and record the data on the blank.

RELIABILITY

An adequate determination of the reliability of such an instrument can only be obtained by repeating. This has not as yet been done on a very extensive scale. On a small sample of twenty-three cases, however, it happened that an individual was interviewed locally by one interviewer and subsequently at headquarters by another. A correlation of .71 between the total scores given by the two interviewers was obtained. This reflects not only the reliability of the instrument but also the agreement of different raters. The reliabilities of the indi-

[3] This fact accounts for the present apparent discontinuity in the scores used in the tables and figures (*e.g.*, 12–16, 18–22, 24–28, etc.).

vidual sections are relatively low because of the limited number of questions employed. On a sample of one hundred cases reliability of the work history section was .57 (odd–even correlation corrected by Spearman-Brown prophecy formula (4)) and that of the personal history, .46. The inter-correlations between these two sections were +.14, a value which suggests considerable independence of the subsections. The sections on family and social history both have reliabilities of only .25. The corrected odd-even correlation for the entire form was .82. This considerably exceeds typical interview reliabilities (1) and is higher than most rating scales (3). It must also be pointed out that the range of scores is restricted because the D.I.G. was given only to applicants passing the preliminary interview and the tests. This restriction of the range of the sample will of course reduce the correlation (4).

VALIDITY

The limited range of individuals to whom the interview is given also makes it difficult to make an adequate determination of validity. The D.I.G. is given as a last step in the selection process and a preliminary interview and psychological test have weeded out a large number of the candidates. Even with this pre-selection, however, considerable predictive value of the Guide is indicated. Data on this point are given in Table 1. Here the average scores on the individual sections of the interview and on the entire interview are given (1) for a group of

TABLE 1

Mean Scores on Four Sections of D.I.G. at Time of Interview of Groups (1) Still on Job and (2) Dismissed

Groups	Sections				Total	σM
	Work History	Family History	Social History	Personal History		
(1) Still on job	4.02	3.62	9.24	7.72	24.60	0.56
(2) Dismissed	2.94	3.14	8.90	6.35	21.33	0.53
				Difference	3.27	
				σ diff.	0.77	
				Critical Ratio	4.25	

individuals who have subsequently proved successful on the job and have remained with the company and (2) for another group hired at the same time but subsequently discharged. The scores were obtained at the time of the interview before employment. The results were compiled after a period of one year, so that individuals classified as "still on the job" have remained a minimum of twelve months. One hundred individuals are represented in each group. The cases were matched for date of employment, interviewers, supervision, etc. No critical score for the interview had yet been set but the selection of individuals was somewhat affected by their scores on D.I.G. and this served to reduce further the range of cases. Despite this fact, however, reliable differences were obtained in the mean scores on two of the sections (Work History and Personal History) and on the total. The difference in total score has a critical ratio of 4.25. The dismissed group had a lower mean score than the employed group on every section.

Data on another method of testing the validity of the D.I.G. are given in Table 2. Here the scores of 300 individuals who

TABLE 2

Percentages of Individuals (1) Still on Job, (2) Resigned, and (3) Dismissed in Various Categories of Scores on D.I.G.

Classification	Scores on D.I.G.				
	0–10	12–16	18–22	24–28	30–34
	%	%	%	%	%
On Job	38.9	42.9	47.2	48.6	59.2
Resigned	22.2	25.7	29.2	29.4	34.7
Dismissed	38.9	31.4	23.6	22.0	6.1
N	18	35	89	109	49

were hired are divided into five categories (0–10, 12–16, 18–22, 24–28, 30–34 incl.). The percentages of the applicants hired in each range who are (1) still on the job, (2) resigned and (3) dismissed are computed. The data indicate there is a progressive increase in the percentage of individuals who are still on the job the higher the score on the D.I.G. at the time of employment. More striking is the progressive decrease in the

percentage of individuals who are dismissed as the scores increase. The percentage of resignations increases with the higher scores as might be expected because of a greater number of alternative opportunities for men with better work histories and personal ability. The data on the relationship between scores and percentages of dismissals are presented graphically in Figure 2.

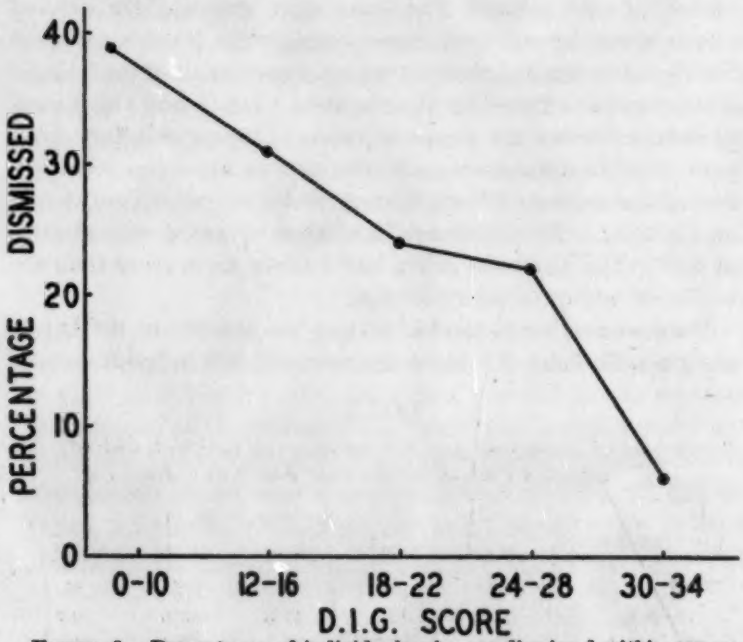

FIGURE 2. Percentages of individuals who are dismissed within a year in groups having various Diagnostic Interviewer's Guide scores at time of employment.

There are few studies available for comparison with the present results, since, as Symonds has pointed out, interviewing "has not been subjected to experimental scrutiny or statistical validation" (6, p. 477). Clark (2), however, has reported results bearing on the validity of interviews with college students. He found that interviews made it possible to predict semester grades with considerable accuracy. The correlation of

the predictions and actual grades was .66 for one interviewer and .73 for another. Much less encouraging are the results of Moss (5) on the use of interviews to predict success in medical schools. By refusing admission to the group rated in the lowest quarter on the basis of an interview, 33 per cent of the failures would be eliminated, but at the same time 23 per cent of those making scholastic averages of 85 or above would be eliminated.

Training of Interviewers. After considerable preliminary work a satisfactory procedure for training the managers of the local offices in the technique of interviewing has been developed. A large number of typical interviews were microphonically recorded with simultaneous use of the D.I.G. blanks. On the basis of these records sample interviews were printed with accompanying filled-in blanks and distributed to the managers of all local offices. Complete instructions on the use and limitations of the blank and a discussion of interviewing in general were then included in an instructions manual.[4]

Weighting by Item Analysis. It appears that the most logical step for future development of the D.I.G. is a weighting of the questions in terms of their discriminative power. Work on this point is now in progress. Results to date indicate that the D.I.G. blank supplements in a very satisfactory way the information obtained from standardized personality and attitude tests. A subsequent study will report these results.

SUMMARY

(1) A standardized interview is described which also permits rating of the applicant by the interviewer. Each section of the blank, which is called the Diagnostic Interviewer's Guide, is subdivided into two parts. In the upper part are the standardized questions which the interviewer asks the applicant. In the lower section is a series of questions which the interviewer asks himself concerning the applicant. The answers are given plus or minus values so that in analyzing the responses of the applicant to the standardized questions the interviewer has an opportunity to rate the applicant.

[4] *Selection Procedure for Men.* (Household Finance Corp., Chicago) 1937, pp. 46.

(2) The correlation between total scores of various interviewers is .71. The corrected odd-even reliability of the entire interview score is .82; the two best sub-tests have reliabilities of .57 and .46 and correlate + .14.

(3) Results on the validity of the D.I.G. are given in terms of the average scores on the various sub-sections of the total test at the time of employment made by individuals who succeed and those who are dismissed. The successful group had a higher average score on every section than the dismissed group. The difference in total score is statistically reliable. Data are also presented showing an increase in the percentage of individuals succeeding on the job with increase in D.I.G. score and a decrease in percentage of dismissals. The two sections showing greatest validity are those on Work History and Personal History. The true extent of the correlations is underestimated because the range of individuals to whom the interview is given is greatly restricted by the preceding selection.

(4) The technique employed in obtaining sample interviews and using these in training the interviewers is discussed.

(5) Work is now in progress on an item analysis of the individual questions to provide weights based on their discriminative power. The results will be incorporated in a subsequent revision.

REFERENCES

1. BINGHAM, W. V., AND B. V. MOORE. How to interview (Rev. edit.) New York: Harper, 1934, 2nd edit., pp. xvi + 308.
2. CLARK, E. L. Value of student interviews. *J. Personnel Res.*, 1926, *5*, 204–207.
3. GARRETT, H. E., AND M. R. SCHNECK. Psychological tests, methods and results. New York: Harper, 1933, Part 2, pp. 1–224.
4. GUILFORD, J. P. Psychometric methods. New York: McGraw-Hill, 1936, pp. xvi + 566.
5. MOSS, F. A. Scholastic aptitude tests for medical students. *J. Assn. Amer. Med. Coll.*, 1931, *6*, 1–16.
6. SYMONDS, P. M. Diagnosing personality and conduct. New York: Century, 1931, pp. xvi + 602.
7. WONDERLIC, E. F., AND C. I. HOVLAND. The Personnel Test: a restandardized abridgment of the Otis S–A test for business and industrial use (in prep.).

OCCUPATIONAL LEVEL AND JOB SATISFACTION

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PROBLEM

STUDIES have been made in which the extent of job satisfaction and its relation to variables such as personality traits, managerial policies, trade union membership, marital status, age, sex, reasons for the choice of an occupation, reasons for the lack of job satisfaction, education, occupational level, intelligence and the use of counseling services, have been investigated. Hoppock (13) has reviewed these, and Hoppock and Spiegler (15) have recently summarized subsequent work.

The purpose of this investigation was to determine the relation of occupational or socio-economic level, and especially of changes in that level, to job satisfaction. As attitudes, interests and ambitions have been shown to be more important, in some cases, than objective facts such as these (11), the effect of discrepancies between vocational aspiration and achievement was also analyzed.

SUBJECTS

The subjects studied were 273 men from 20 to 68 years of age, their mean age being 38.01 and the standard deviation 10.79. They were members of avocational or hobby groups, the contact with them having been made on this basis. None of the group had less than a grammar-school education, 1.5 per cent had finished only grammar school, 6 per cent had finished the seventh or eight grade, 12.5 per cent had some high-school education, 21.5 per cent had finished high school, 12.5 per cent had some college training, 22 per cent had graduated from col-

lege, 17.5 per cent had done graduate study beyond college, and 5 per cent had obtained special training of one kind or another after leaving public school; 1.5 per cent gave no information concerning their education. Most of the group were married (63 per cent), 29.5 per cent being single, 1.5 per cent divorced, 1.5 per cent widowed, and 4.5 per cent not specifying. No unemployed men were included in the cases analyzed.

METHOD

During the spring of 1938 the writer explained the purpose of the study to New York City groups at their regular meetings, then distributed the blanks to be filled out; out-of-town groups were reached by mail, in some cases through officers of clubs who distributed the blanks at meetings, in other cases directly, with an explanatory letter. The 273 tabulated returns represent 30.33 per cent of a total of 900 blanks distributed.

The questions, responses to which are analyzed in this report, were part of a more comprehensive investigation dealing with avocations and were included for the light they might throw on hobbies. To the subjects, therefore, the study was one of avocational interests; job satisfaction was not a major issue. The questionnaire asked for the following data: age, education, special training, occupational history, avocational history. Questions bearing on the problems raised here were:

1. "What do you think you might like to be?"
2. "Are you satisfied with your opportunities to express yourself in your work?"
3. "If not, why?"

CLASSIFICATION OF OCCUPATIONS

Occupational classifications have been made on a variety of bases, including prestige value (1), socio-economic status (25), intelligence levels (5, 10), abilities (2), and interests (22, 28, 29). The first type of classification has the limitation of being largely dependent on what persons *not* in an occupation think of it: it is a sociological rather than a psychological classifica-

tion. The second type is also based on factors not inherent in the occupation, such as the number of trained workers. Groupings based on abilities and intelligence take into account both the nature of the work and of the individual: they suffer from the weakness, however, of disregarding the attitudes of people in general and therefore (to a lesser extent, presumably), of the individual concerned. Even classifications based on interest patterns are subject to this criticism, a fixational interest, for instance, being an important attitude not necessarily reflected in the individual's pattern of interests.

Three factors included in the above classifications seem important in ranking an occupation. One is its prestige value in society; the second is the amount of training or education necessary for entrance into it or the amount of ability required for success in it; the third is the opportunity it affords for the expression of an individual's interests and for the use of his abilities—in other words, its potential challenge to the worker.

Examination of the data of this study seemed to indicate the desirability of a sixfold classification, including Unskilled, Semi-Skilled, Skilled, Commercial and Sub-Professional, Proprietary-Managerial, and Professional groups, classification which takes the first two factors into account. After this stage of the work had been completed, Edwards' Scale (6*a*, 6) came to our attention, and the two were found to be identical.

FINDINGS

The *extent of job satisfaction* has been found to vary considerably, depending apparently on the nature of the group studied. Hoppock (13), after reviewing previous studies, concluded that about 60 per cent of the gainfully employed are satisfied with their work. Our findings agree with the general trend, 174 or 63.74 per cent of the 273 men being satisfied with their jobs and 99 or 36.67 per cent dissatisfied.

Occupational level has been found to be related to job satisfaction in several investigations (8, 13, 17, 26, 30), but the relationship has not always been positive and linear.

The results of this study, reported in Table 1, indicate that there are probably not one, but two, occupational scales, one of three steps, the other of two (or three, but too few Unskilled cases were included to justify any conclusions concerning this last level). The first scale is the *white collar scale,* with Professional workers at the top, the Proprietary-Managerial group (hereafter the Managerial group) next, and the Commercial and Sub-Professional (hereafter the Commercial) group at the bottom. The second, or *manual, scale* consists of the Skilled, Semi-Skilled, and (if Uhrbrock's, Thorndike's, and *Fortune's* data, otherwise consistent with ours, may be used to supplement it) the Unskilled groups, in the order of decreasing percentage of satisfaction. One other investigation (6, p. 9) contains data which indicate the need for two scales, although the suggestion is implicit only.

TABLE 1

Occupational Level and Job Satisfaction

	Satisfied		Dissatisfied		Total
Professional	77	85.56%	13	14.44%	90
Managerial	28	74.22%	10	25.78%	38
Commercial	36	41.86%	50	58.14%	86
Skilled	19	55.88%	15	44.12%	34
Semi-skilled	10	47.62%	11	52.38%	21
Total	170	63.33%	99	36.67%	269

$\chi^2 = 41.01$
$df = 4$
$P < .01$

Table 1 shows the decreasing percentage of satisfied workers as one descends the white collar scale, 85.56 per cent of the Professional, 74.42 per cent of the Managerial, and 41.86 per cent of the Commercial groups being satisfied with their jobs. The same tendency is evident in the manual scale (lower half of Table 1), 55.88 per cent of the Skilled and 47.62 per cent of the Semi-Skilled finding satisfaction in their jobs. No con-

clusions can be drawn for the Unskilled group, as has already been indicated. That the relationships found between occupational level and job satisfaction are significant is indicated by a χ^2 of 41.01 which, with 4 degrees of freedom (the Unskilled level is not included), gives a P of less than .01.

The two levels of the manual scale for which data are available exceed the lowest level (Commercial) of the white collar scale, but fall below the two highest levels (Professional and Managerial) in job satisfaction. This agrees with Uhrbrock's data and with those of *Fortune* and Thorndike to the extent that the "factory" and "mechanical and manual" groups of the last two studies are largely unskilled. Taken as a whole, these studies would also lead one to conclude that the Unskilled group falls below the Commercial in job satisfaction.

Change of occupational level does not seem to have been covered by studies in job satisfaction. Table 2 gives the data from our study, indicating the number and percentage of satisfied and dissatisfied cases which moved from one occupational

TABLE 2

Amount of Change of Occupational Level

Amount of change	Satisfied		Dissatisfied		Total	
Up 5 steps	0	.....	0	.....	0	.....
4	0	.....	0	.....	0	.....
3	5	83.33%	1	16.67%	6	2.22%
2	14	77.78%	4	22.22%	18	6.67%
1	18	58.06%	13	41.94%	31	11.48%
0 (no change)	124	65.32%	66	34.68%	190	70.37%
Down 1 step	5	50.00%	5	50.00%	10	3.70%
2	4	33.33%	8	66.67%	12	4.44%
3	1	50.00%	1	50.00%	2	.74%
4	0	.....	1	100.00%	1	.38%
5	0	.....	0	.....	0	.....
Total	171	.....	99	.....	270	100.00%

$\chi^2 = 9.03$
$df = 5$ (steps -2 to $+3$ only)
$P <$ .10 to .20

level to another. "Moves" were tabulated once for each person only when there was a change from one level, as defined in this study, to another. The highest previous permanent position and the present position were used in determining the nature and direction of change. "No change of level" was tabulated as 0; a change of one degree, as from office clerk to retail merchant, as +1 (merchant to clerk being −1); a change of two degrees as ±2; and so on. The scale runs from +3 to −2, because only three cases fell beyond those limits.

Job satisfaction is seen to increase as the amount of upward change increases, to decrease as the amount of downward change increases, "no change" only slightly interrupting the trend, the percentage of those satisfied rising from 33.33 at −2 to 50.00 at −1, 65.32 at 0, 58.06 at +1, 77.78 at +2, and 83.33 at +3. These differences in amount of change do not, however, appear to be significant, their χ^2 value being 9.03, for which 5 degrees of freedom give a P of from .10 to .20. The *amount of change* of occupational level, that is, whether one moves up (or down) one or two or three degrees, has not been shown, then, to make much difference in job satisfaction, although the consistency of the trend indicates that it may be of some importance.

TABLE 3

Direction of Occupational Change

Direction of change	Satisfied	Dissatisfied	Total
Upward	37	18	55
No change	124	66	190
Downward	9	13	22
Total	170	97	267

$\chi^2 = 81.12$
$df = 2$
$P < .01$

When the amount of change is disregarded and the data treated only for the *direction of change* (whether upward or downward in the occupational world), as in Table 3, a χ^2 value

of 81.12 is obtained, 2 *df* yielding a *P* of considerably less than .01. We can conclude that, in a group such as ours, the man who remains at the highest occupational level yet reached, one who has been able to rise in the world or to hold on to what he had at the start, has about two chances in three of finding satisfaction in his work; one who has had to take a job lower in the occupational scale than one held previously has only about four chances in ten of being satisfied with it.

This appears to indicate that it is not how high one has risen nor how low one has fallen that is significant in adjustment, but whether one has been able to maintain one's status, original or newly-won.

The last two columns of Table 2 show the social or occupational mobility of the subjects. Most of them (70.37 per cent) have never changed their occupational level; about one-fifth (20.37 per cent) have improved their status; and one-tenth (9.26 per cent) have come down in the world. Data for comparisons are scarce (6), but this seems a surprisingly static picture, rather more so than Davidson and Anderson's pre-depression study (33 per cent of changes involved "climbing," 23 per cent "falling," and 44 per cent were horizontal, from 34 to 78 per cent of each level being employed at the level on which first employed), although there is agreement on the prevalence of climbing and on the rarity of great changes. This may indicate that the past few years have tended to "freeze" occupational and social levels, to erect greater barriers between them.

Discrepancies between aspiration and achievement also appear not to have been previously related to job satisfaction. Table 4 gives our data for the cases for which such information was available. Tabulation was done as for Table 2, with too few cases at or below – 2 for analysis. The decline in job satisfaction as aspiration rises above achievement is clear, except at + 3, where the cases are equally divided. At 0 change desired, 76.50 per cent are satisfied; at + 1, 39.13 per cent; at + 2, 26.32 per cent; at + 3, 50.00 per cent; at + 4, 20.00 per cent. Those whose ambitions lie one degree below their present level are

about as well satisfied with their work as those who desire no change of level, 75 per cent of this group being satisfied. The χ^2 value of 121.16, with 5 *df* (no changes below −1 or above +4 included), gives a *P* of less than .01, indicating that these relationships are significant; when treated for direction of change desired, regardless of amount, the value is 118.09, 2 *df* giving

TABLE 4

Discrepancies between Aspiration and Achievement

Amount of change	Satisfied		Dissatisfied		Total	
Up 5 steps	0		0		0	
4	1	20.00%	4	80.00%	5	1.85%
3	7	50.00%	7	50.00%	14	5.18%
2	10	26.32%	28	73.68%	38	14.07%
1	9	39.13%	14	60.87%	23	8.51%
0 (no change)	140	76.50%	43	23.50%	183	67.77%
Down 1 step	3	75.00%	1	25.00%	4	1.48%
2	0		1	100.00%	1	.38%
3	0		1	100.00%	1	.38%
4	1	100.00%	0		1	.38%
5	0		0		0	
Total	171		99		270	100.00%

$\chi^2 = 121.16$
$df = 5$ (steps −1 to +4 only)
$P < .01$

a *P* of less than .01. One can conclude that, in the universe from which this sample was drawn, men who aspire to occupational levels above those at which they find themselves tend to be dissatisfied with their work, and that the greater the discrepancy between aspiration and achievement the greater will be the proportion of dissatisfaction. Those interested in lower levels, however, tend to be satisfied.

Reasons for lack of job satisfaction have been studied by a number of investigators and summarized by Hoppock (13). Data on this subject were available for 83 of our subjects; the reasons which they themselves gave were classified and appear in Table 5.

TABLE 5

Economics, Management, and Work in Discontent

Cause	No.	Per cent
Nature of the work	41	49.30
Economic factors	30	36.15
Management	7	8.43
Doubtful	5	6.02
Total	83	100.00

Lack of similarity of job requirements to individual abilities and interests (49.30 per cent) is most productive of vocational discontent, with external factors (economic conditions and opportunities) a close second (36.15 per cent). Factors related to the employer do not seem to be so important (8.43 per cent), but this figure would undoubtedly be raised were the reasons relating to self-expression and experimentation more thoroughly explored, some of this group having added comments such as "the boss does not encourage it."

These findings agree with those of Hoppock (13), whose data we have classified in the same manner as our own, in placing individual differences in man and work first (35 out of 74 cases in Hoppock's study), but disagree on the other two factors, Hoppock putting management next (25 out of 74) and external factors last (14 out of 74). This difference can hardly be attributed to differences in economic conditions, both studies having been made during depression years and with a falling business index. Other studies have not approached this question in such a way as to make the data comparable; management, however, has generally been found to be important in job satisfaction (18), although Fairchild (7) found it less so than the nature of the work when the worker is skilled in his job.

One might suppose that men with definite vocational or avocational interests and abilities (such as the 273 hobbyists in this study) tend, like Fairchild's "skilled" workers, to be satisfied or dissatisfied largely with the *type of work* in which they are engaged, whereas others tend to be satisfied or dissatisfied

largely with *management*, external factors probably affecting the "skilled" or "interested" workers more in so far as they restrict the scope of their work.

Age has been found to be related to job satisfaction by Thorndike (26, 27) and by Hoppock (13, 14), the latter reporting a correlation coefficient of .24. Fryer (9) and Kornhauser and Sharp (16) report no relationship, however, and Strong (23) found that, although interest in occupations decreased with increasing age, the order of preference remained the same. No studies have been seen which relate these factors to occupational level.

TABLE 6

Age and Job Satisfaction

Age	Satisfied		Dissatisfied		Total
20–24	28	71.80%	11	28.20%	39
25–34	49	48.04%	53	51.96%	102
35–44	50	74.63%	17	25.37%	67
45–54	28	65.12%	15	34.88%	43
55–64	15	88.21%	2	11.79%	17
65 up	4	80.00%	1	20.00%	5
Total	174		99		273

$\chi^2 = 31.41$
$df = 5$
$P < .01$

Table 6 gives the data on age and job satisfaction for our investigation. The χ^2 value of 31.41, df being 5, gives a P of less than .01, indicating that there is a significant relationship between age and job satisfaction. A study of the figures reveals, however, that this relationship is not linear but that there is apparently a "satisfaction cycle" through which men go, being satisfied in the early 20's, somewhat dissatisfied between the ages of 25 and 34, and tending to be satisfied again thereafter, the percentages being, in the order of increasing age, 74.80, 48.04, 74.03, 65.12, 88.21, and 80.00. As has been shown in other areas of adjustment (*e.g.*, 12) the period from 25 to 34 is a

critical age during which men tend to be less satisfied than normally. It is interesting to note that the period from 45 to 54 also brings a relative decline of the percentage satisfied, although, as will be seen, this may be due to a sampling error.

One possible explanation of the above trend is that younger men, just getting a start in the world, are exploring its possibilities, glad to have almost any job, and confident of their ability to get ahead. Then, after about age 25, comes a period of dissatisfaction with the old job, of wanting to get ahead more rapidly. Additional effort is expended [as indicated by Smith's finding (21) that this is the period at which correspondence courses are most popular], and increasing age brings greater achievement and greater satisfaction. Again, after 45, there is a relative increase in dissatisfaction, due to a change in the emphasis of interest: work loses some of its attractions and other types of satisfactions have not yet been developed. After a period of readjustment, new, non-vocational sources of enjoyment are found and the improved general adjustment is shown in increased job satisfaction. This explanation is, obviously, based on Bühler's theory of life stages (4).

The relationship of *age to occupational level* was analyzed as a possible check on this Bühlerian explanation of the satisfaction cycle. The data appear in Table 7, which shows that

TABLE 7

Age Groups and Occupational Level

Age	Semi-skilled	Skilled	Commercial	Managerial	Professional	Total
20–24	9 24.32%	5 13.51%	17 45.95%	3 8.11%	3 8.11%	37
25–34	8 8.00%	17 17.00%	34 34.00%	8 8.00%	33 33.00%	100
35–44	3 4.48%	8 11.94%	16 23.88%	12 17.97%	28 41.79%	67
45–54	1 2.32%	4 9.30%	14 32.56%	9 20.93%	15 34.89%	43
55–64	0	0	4 23.53%	4 23.53%	9 52.94%	17
65 up	0	0	1 20.00%	2 40.00%	2 40.00%	5
Total	21	34	86	38	90	269

$\chi^2 = 82.90$
$df = 20$
$P < .01$

the young men in our study do appear to be starting at the bottom of the ladder, especially in terms of two, the white collar and the manual scales: a smaller percentage of men aged 20–24 are engaged in Skilled (24.32 per cent), Managerial (8.11 per cent), and Professional (8.11 per cent) occupations than in Semi-Skilled (24.32 per cent) and Commercial (45.95 per cent). At the next age level the emphasis has shifted from Semi-Skilled (8.00 per cent) to Skilled (17.00 per cent), and to a lesser extent from Commercial (34.00 per cent) to Professional (33.00 per cent): at this, the "critical age" for job satisfaction, some shift has taken place from lower to higher levels, but the Managerial group, which should draw largely from the Commercial, is still small (8.00 per cent). At the next age level, 35–44, where satisfaction increases, the Semi-Skilled level has declined further (4.48 per cent), the Skilled group has shrunk somewhat (11.94 per cent), as has the Commercial (23.88 per cent), and the Managerial group has risen (17.97 per cent) for the first time, while the Professional group continues to increase (41.79 per cent). The same general trends continue at the next age levels, 45–54 and 55–64, except that the Commercial group increases temporarily at 45 (32.56 per cent) at the expense of the Professional group (34.89 per cent). This last is difficult to explain and may be due to sampling errors: the recovery of the Professional group at ages 55–64 (52.94 per cent) would seem to indicate that such is the case. (If this is so, the increase in the relatively dissatisfied Commercial group at ages 45–54 might explain the relative decline in job satisfaction at that period, smoothing out the satisfaction cycle and invalidating any Bühlerian theory of job satisfaction in middle and old age.) The significant nature of the trends reported is shown by a χ^2 value of 82.90, *df* being 20, and *P* less than .01.

This analysis of our data, the χ^2 being so great, is taken as confirming our explanation of the satisfaction cycle, with the possible exception of the part relating to Bühler's "maintenance stage." It also indicates the inadequacy of attempts to relate age to job satisfaction by linear correlation methods.

The relationship of age to job satisfaction within a given occupational level was determined, for it might be argued that the tendency is simply for older men to be better satisfied than younger men, that experience makes that which is uninteresting interesting. Table 8 shows these relationships.

Mean ages and standard deviations for satisfied and dissatisfied men are shown for each occupational level, together with critical ratios for adjacent levels. With the exception of the

TABLE 8

Age and Job Satisfaction at a Given Occupational Level

Occupational level	Age of satisfied		Age of dissatisfied		D/σ_d
	Mean	S.D.	Mean	S.D.	
Professional	39.85	10.80	35.31	8.47	1.70
Managerial	40.45	11.25	43.07	10.73	.65
Commercial	34.62	10.72	32.72	2.85	1.04
Skilled	34.22	8.60	32.91	5.75	.54
Semi-skilled	27.45	7.37	27.38	6.09	.02

Managerial group, the satisfied appear to be slightly older; the critical ratios (D/σ_d) of .02 to 1.70 indicate, however, that these differences are not significant. This is taken as indicating that an increase in age, in and of itself, does not result in increased job satisfaction.

To test further the hypothesis that the increase in job satisfaction with age is due to an accompanying rise in occupational level, mean ages for each occupational level were tabulated as in Table 9, mean age rising with occupational level except in the Professional group, which falls immediately below the Managerial level. That this trend is probably significant is shown by critical ratios between adjacent levels which range from 1.08 to 2.94, confirming the consistency of the trend.

The above data point to the conclusion that the increase in job satisfaction with age is not due to a tendency toward resignation or to changing interests but is attributable rather to a tendency to rise in the occupational world as one grows older and desired satisfactions are found in sought-after types of work on a higher

TABLE 9

Age and Occupational Level

Occupational level	Mean age	S.D.	D/σ_d
Professional	39.16	10.47	
			1.08
Managerial	41.51	11.05	
			2.09
Commercial	34.75	9.90	
			1.27
Skilled	32.70	7.66	
			2.94
Semi-skilled	27.42	6.30	

level. This conclusion agrees with the findings of Strong (23) concerning the stability of interests, and of Cattell (5) concerning "promotional decline," explains the failure of Fryer (9) and of Kornhauser and Sharp (16) to find any relationship between age and job satisfaction, and throws more light on the subject than does Hoppock's (14) low correlation coefficient.

DISCUSSION

It is interesting to note that job satisfaction as here portrayed fits into the American tradition according to which one eventually "makes good." That this should be the case in spite of recent economic trends is perhaps natural, as we have confined our study to employed men; Hall (12), Rundquist and Sletto (19), and Lazarsfeld (17) have told the rest of the story.

Objections might be made to the occupational scale which we have used, in which two rather unrelated factors have been lumped together. This same objection might be made to Beckman's Scale, in spite of its emphasis on prestige value. Perhaps studies of this type should use three occupational scales: one for prestige value, one for intelligence, and one for "potential challenge to the individual." It would be interesting, although not within the scope of this study, to see what differences this would make in the findings. Such an analysis is now being made.

In view of the preponderant numbers of workers on the lowest rungs of the two occupational scales and the prevalence of dis-

satisfaction on at least one of those levels, the social implications of the findings relative to occupational level and job satisfaction are of no little importance. Remedial and preventive work should probably be done to change the aspiration levels of some individuals, bringing them more in line with individual abilities and social possibilities; personnel work in business and industry should develop potential sources of job satisfaction.

The finding relating to the amount of change in occupational level interests us. We expected this to be an important factor: perhaps its insignificance is due to a tendency to rise or fall to a generically related occupation (in terms of skills and interests), the nature of the work thus tending to minimize the effect of the amount of social distance. The importance of direction of change would, then, be due to social distance (conceived in terms of the existence of barriers rather than their number or width) and to "challenge" to the individual. A subjective appraisal of the data appears to confirm this explanation, the cases including, for instance, some engineers who are now in the skilled trades, and some skilled workers who have risen to engineering jobs.

Certain other studies, not dealing directly with our topic, throw some light on the question of discrepancies between vocational aspiration and achievement and should be briefly referred to here (3, 5, 9, 20). These indicate that the more intelligent are more apt to make satisfactory adjustments, *i.e.*, to aspire to and attain their real ability level.

SUMMARY

Questionnaires covering their personal, educational, occupational, and avocational history were filled out by 273 employed men, ages 20 to 68, who were approached through their interest in any one of a number of avocations. Items were included pertaining to job satisfaction. The major findings were as follows:

1. Slightly over 60 per cent of the group were satisfied with their jobs.

2. There is a significant, but not linear, relationship between occupational level and job satisfaction.

3. Two occupational scales were found to exist: one of white collar workers; the other of manual. Professional occupations are most productive of job satisfaction, Managerial next, Commercial least, in the white collar scale; skilled occupations rank highest in the manual scale.

4. These scales overlap when compared in terms of productivity of job satisfaction, the Skilled and the Semi-Skilled groups (two highest manual) ranking above the Commercial group (lowest white collar) in job satisfaction.

5. Amount of change of occupational level had little, direction of change considerable, effect on job satisfaction.

6. Maintenance of the highest attained occupational status is the important factor in the relationship of change of occupational level to job satisfaction.

7. Roughly 70 per cent of the group had never changed occupational level; comparisons with an earlier study suggest that this may indicate a decrease in occupational mobility in recent years.

8. "Aspirational discrepancy," or the size of the gap between present occupational level and the level aspired to, is negatively related to job satisfaction.

9. The nature of the work itself appeared as the most frequent reason, in the minds of the men themselves, for disliking a job, economic reasons ranking second, and managerial policies an infrequent third.

10. Job satisfaction was found to develop cyclically, older adolescents (20–24) tending to be satisfied with their jobs, young men (25–34) dissatisfied, and older men satisfied, with a possible temporary decrease at ages 45–54: this was taken as partial confirmation of Bühler's theory of life stages.

11. There is a tendency for men to rise in the occupational world as they get older: this is interpreted as explaining away the correlation of age with job satisfaction, reported by other investigators.

12. Some problems of interpretation, some important social implications, and some needed research were pointed out in conclusion.

BIBLIOGRAPHY

1. Beckman, R. O. A new scale for gauging occupational rank. *Person. J.*, 1934, 13, 225–233.
2. Bingham, W. V. Aptitudes and aptitude testing. New York: Harper's, 1937. Pp. 383.
3. Bird, C., and Paterson, D. G. Commercial correspondence courses and occupational adjustments of men. Minneapolis: Univ. Minnesota Press, *Employment Stabilization Research Bull.*, 1934, 7, No. 2.
4. Bühler, C. Der menschliche Lebenslauf als psychologisches Problem. Leipzig: Herzel, 1933. Pp. 328. Also: The curve of life as studied in biographies. *J. Appl. Psychol.*, 1935, 19, 405–409.
5. Cattell, R. B. Occupational norms of intelligence. *Brit. J. Psychol.*, 1934–35, 25, 1–28.
6. Davidson, P. E., and Anderson, H. D. Occupational mobility in an American community. Stanford University: Stanford Univ. Press, 1937. Pp. 203.

6a. Edwards, A. M. A socio-economic grouping of the gainfully employed workers of the U. S. *J. Amer. Statis. Asso.*, 1933, 28, 377–387.

7. Fairchild, M. Skill and specialization. *Person. J.*, 1930, 9, 28–71, 128–175.
8. Fortune: Quarterly Survey XI. *Fortune*, 1938, 17, 83–88.
9. Fryer, D. Intelligence and interest in vocational adjustment. *Ped. Sem.*, 1923, 30, 127–151.
10. ———. Occupational intelligence standards. *School and Soc.*, 1922, 16, 273–277.
11. ———. Measurement of interests. New York: Holt, 1931. Pp. 488.
12. Hall, O. M. Attitudes and unemployment. *Arch. Psychol.*, 1934, No. 165. Pp. 65.
13. Hoppock, R. Job satisfaction. New York: Harper's, 1935. Pp. 303.
14. ———. Age and job satisfaction. *Psychol. Monog.*, 1936, 47, 115–118.
15. Hoppock, R., and Spiegler, S. Job satisfaction: researches of 1935–1937. *Occup.*, 1938, 16, 636–643.
16. Kornhauser, A. W., and Sharp, A. A. Employee attitudes. *Person. J.*, 1932, 10, 393–404.

17. LAZARSFELD, P. S., *et al.* Coming of age in Essex County. Univ. Newark, 1937. Pp. 126.
18. PUTNAM, M. L. Improving employee relations. *Person. J.*, 1930, 8, 314–325.
19. RUNDQUIST, B. A., and SLETTO, R. R. Personality in the depression. Minneapolis: Univ. Minnesota Press, 1937. Pp. 398.
20. SEIPP, E. One hundred clients of the adjustment service. *Amer. Asso. Adult Educ.*, 1935. Pp. 31.
21. SMITH, G. B. Purposes and conditions affecting participation of adults in the Home Study Department. *Teach. Coll. Contrib. Educ.*, 1935, No. 663. Pp. 86.
22. STRONG, E. K., JR. Classification of occupations by interests. *Person. J.*, 1934, April.
23. ———. Change of interest with age. Stanford University: Stanford Univ. Press, 1931. Pp. 235.
24. SYMONDS, P. M. Diagnosing personality and conduct. New York: Appleton-Century, 1931. Pp. 602.
25. TAUSSIG, F. W. Principles of Economics, Vol. II. New York: Macmillan, 1927. See pp. 134–137.
26. THORNDIKE, E. L. Prediction of vocational success. New York: Commonwealth Fund, 1934. Pp. 284.
27. ———. Worker's satisfaction: likes and dislikes of young people for their jobs. *Occup.*, 1935, 13, 704–706.
28. THURSTONE, L. L. A multiple factor study of vocational interests. *Person. J.*, 1931, 10, 198–205.
29. ———. A vocational interest schedule. *Psychol. Bull.*, 1935, 32, 719.
30. UHRBROCK, R. S. Attitudes of 4430 employees. *J. Soc. Psychol.*, 1934, 5, 365–377.

THE RELATIONSHIP OF VALIDITY COEFFICIENTS TO THE PRACTICAL EFFECTIVENESS OF TESTS IN SELECTION: DISCUSSION AND TABLES

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IT has often been pointed out that the magnitude of the correlation coefficient as such is not an adequate representation of the magnitude of the relationship between the two variables which are under consideration. A number of different statistical constants have been proposed by various persons, as giving a more satisfactory representation of the real magnitude of a relationship between two variables. All of these constants are relatively simple functions of the Pearson r.

These include a class of functions of r which bear directly upon an evaluation of the extent to which one variable may be predicted from the other when the correlation coefficient is of a given magnitude. These functions of r include Kelly's alienation coefficient, k, which is $\sqrt{1-r^2}$, and such functions of k as Hull's measure of efficiency, E, which is $1-k$, and Odell's g, which is $k/\sqrt{2}$.

All of these ways of evaluating the correlation coefficient have one fundamental characteristic in common, as might be expected from the fact that they are all closely related to the alienation coefficient. That is, that as the size of the correlation coefficient increases the extent to which one variable can be predicted from the other increases more and more rapidly. For example, an r of .50 is usually considered to be only 13% as good as an r of 1.00. It is considered that an r of .87 is only half as good as an r of 1.00.

The wide-spread acceptance of such measures as the correct way of evaluating correlation coefficients has brought about a

considerable pessimism with regard to the validity coefficients which are ordinarily obtainable when tests are tried out in the employment office of a business or industry or in an educational institution. These validity coefficients may range from .20 to .50, although they may occasionally be somewhat higher. It is disconcerting to apply the customary procedures in evaluating these coefficients and discover that the so-called "efficiency" of these tests is only 2% to 13%.

It is the purpose of this paper to point out that under the conditions found when tests are used for selection of employees or students, correlation coefficients within the range of .20 to .50 may represent considerably more than 2% to 13% of the effectiveness of an r of unity.

Chart I illustrates a typical scatter diagram, or normal correlation surface, with test scores represented along the base line and criterion scores along the ordinate. This chart is intended to illustrate the results of a validity check-up of a test in an educational or industrial situation. All persons who are above line SS′ (area A + area D) are those who are considered to be satisfactory, while all those below that line (area B + area C) are considered unsatisfactory.

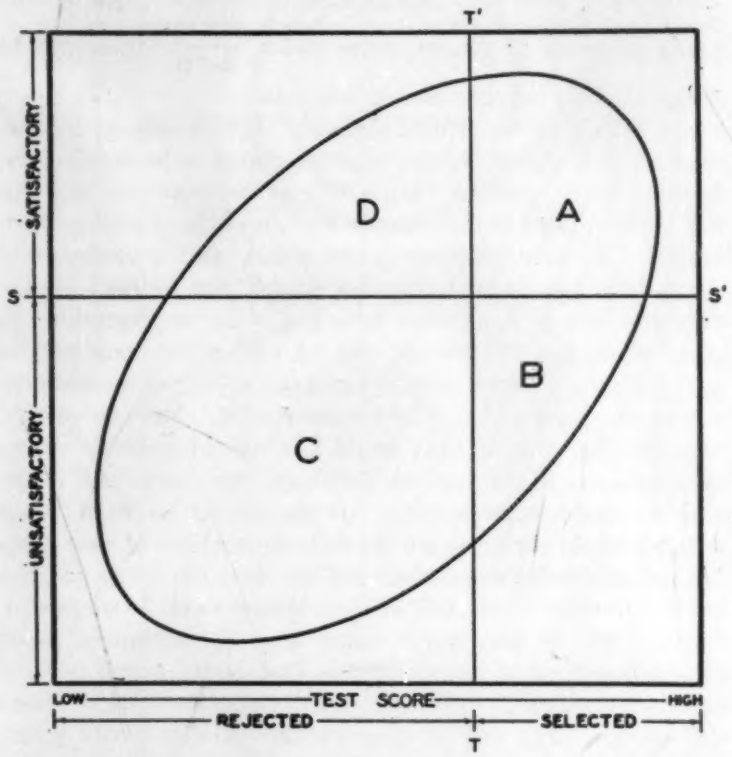
We have divided the persons into those who are below a selected critical test score, represented by line TT′, and those who are above that critical score. The former would obviously be those who would be rejected in terms of their test scores, if the test were used for selective purposes, and the latter those who would be selected if the tests were so used.

The position of line TT′, it will be clear, will vary with the employment situation. Under some conditions it might conceivably be necessary to accept practically every applicant who came to the employment office regardless of his qualifications. In such a situation, of course, a test is of no use, no matter what its validity. In other situations, however, it may be possible to select only the most promising tenth, third, or half of those who apply. Line TT′, then, represents the *selection ratio.*

It will be noted that as soon as one begins to select persons who are above the critical score, represented by the line TT′,

one begins to assemble a new employee group which distributes like that portion of the present group which is above line TT', that is, within the area (A + B) on Chart I. The common as-

CHART I



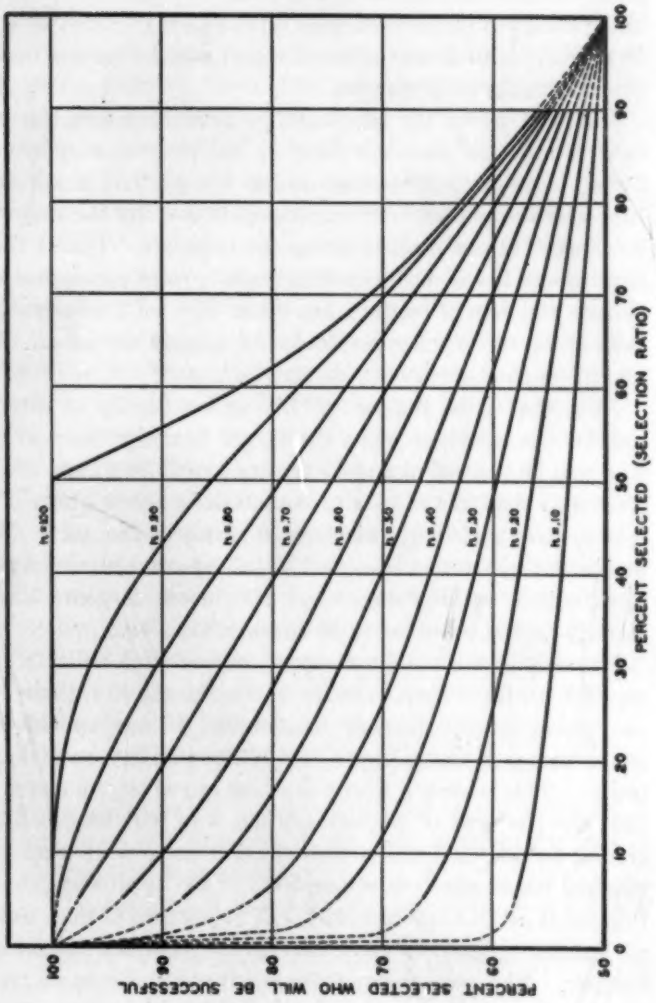
sumption is being made, of course, that the applicant group and the present employee group are similarly constituted. Whereas in the original employee group, before using tests for selection, the proportion of satisfactory employees was represented by $\frac{A+D}{A+B+C+D}$, there is now being developed an employee group in which the proportion of satisfactory employees will approach $\frac{A}{A+B}$.

It will be clear that if line SS′ and line TT′ are specified, the usefulness of a test may be represented in terms of the ratio, $\frac{A}{A+B}$. Furthermore, with line SS′ and line TT′ specified, the usefulness of tests with various validity coefficients can be compared in terms of the respective ratios, $\frac{A}{A+B}$, which will be obtained if the tests are used in selection.

Let us now take a typical example. Let us suppose that we consider half of our present employee group to be satisfactory. In other words, area (A + D) is 50% of the total area, and line SS′ is thus placed at the mean or median of the criterion distribution. We have, let us say, a test with a validity coefficient of .50 and the employment situation is such that we need to take only the best 30% of those who apply for employment. In other words, line TT′ is so set that (A + B) will contain 30% of the total area. Under these circumstances, 74% of those chosen will be successful and only 26% unsuccessful. Now, let us compare that figure with what would be obtained under the same circumstances if the validity coefficient were zero, and if the validity coefficient were unity. If the validity coefficient were zero, we would obviously get the same proportions of unsuccessful and successful employees as if we were not using the test at all. In other words, half of those chosen would be successful. If the coefficient were unity, under these circumstances, *all* of those selected would be successful. That is, the lowest possible validity would result in the selection of employees 50% of whom will be successful, and the best possible validity would result in the selection of employees 100% of whom will be successful. When the validity of the test is .50, the use of the test results in the selection of employees 74% of whom will be successful. The practical usefulness of a test which increases the proportion of successful employees to this extent does not seem to be adequately expressed by the efficiency figure of 13% which is usually associated with a test of that validity. If we can choose the best one out of ten, a validity coefficient of .50 increases the proportion of successful employees to .84.

CHART II

PREDICTIVE VALUE OF D FOR VARIOUS SELECTION RATIOS WHEN 50 PERCENT OF THE EMPLOYEE GROUP ARE CONSIDERED TO BE SUCCESSFUL



In general, with a given proportion of the present group being considered successful and with a given validity coefficient, the usefulness of the test with that validity increases as one is in a position to accept a smaller and smaller proportion of the candidates for employment.

Chart II shows the relationships between r and the selection ratio when one considers 50% of the present employee group to be successful. Selection ratios are plotted along the base line, and the per cents of employees chosen by the test who will be successful are plotted along the ordinate. Under these circumstances it will be clear that a new group cannot possibly be chosen which will contain less than 50% of successful people, even if we use a selection device of no validity at all. Hence, all curves start from 50% on the ordinate.

Note that with regard to this entire family of curves, the smaller the selection ratio, the larger is the percent of persons who will be successful among those selected by means of the test. Note also that in the case of correlations below about .70 these curves are positively accelerated toward the left. That is, under the conditions specified in this chart, the usefulness of a test with a validity less than .70 increases more and more rapidly as the selection ratio becomes smaller.

Not only does the usefulness of tests of such validity increase rapidly as the selection ratio is decreased, but their relative usefulness is still further emphasized if one considers what could be accomplished by a test if the validity coefficient were unity. This is shown in the topmost curve on the chart. Note that the per cent of persons chosen who will be successful increases as one cuts down the selection ratio until that point is reached where one is selecting 50% of the applicant group. At this point all of those selected will be successful and, naturally, no further gains can be made as one cuts the selection ratio further. The usefulness of the small correlations, on the other hand, continues to increase to the left of this point. Note that a validity coefficient of .50 is more useful when one is selecting only 20% of the applicant group than a correlation of unity would be if one were selecting 65% of the applicants.

It is our belief that a useful method of evaluating a validity coefficient in the employment situation is to ask oneself the question: If a given per cent of the present employee group is considered successful and if a given proportion of the applicant group is to be selected, what proportion will be successful in the new group selected by means of the test? How does this compare with the proportion of successful persons who could be chosen under equivalent circumstances with a selective device of no validity, and with a selective device of perfect validity?

We do not wish to imply that these relationships have been entirely unrecognized. The importance of the selection ratio as affecting the real usefulness of a validity coefficient was pointed out, for example, by Hull in a footnote (p. 276) in his book, *Aptitude Testing*.[1] Thurstone discusses the matter at some length in his book, *The Reliability and Validity of Tests*,[2] and the relationships can be worked out from *Computing Diagrams for the Tetrachoric Correlation Coefficient*.[3]

We believe, however, that the emphasis in current literature upon the k and E methods of interpreting correlation coefficients has led to some unwarranted pessimism on the part of many persons concerning the practical usefulness in an employment situation of validity coefficients in the range of those usually obtained. We believe that it may be of value to point out the very considerable improvement in selection efficiency which may be obtained with small correlation coefficients.

TABLES

Making use of Pearson's "Tables for Finding the Volumes of the Normal Bivariate Surface,"[4] we have prepared a set of tables of the relationships among:

[1] Clark L. Hull. Aptitude Testing. Yonkers-on-Hudson, N. Y.: World Book Co., 1928.

[2] L. L. Thurstone. The Reliability and Validity of Tests. Ann Arbor, Mich.: Edwards Brothers, Inc., 1931. Pp. 57–61.

[3] L. Chesire, M. Saffir, and L. L. Thurstone. Computing Diagrams for the Tetrachoric Correlation Coefficient. Chicago: The University of Chicago Book Store. 1933.

[4] Karl Pearson. Tables for Statisticians and Biometricians. Part 2. London: Biometric Laboratory, University College, 1931. Pp. 78–109.

1. PROPORTION OF EMPLOYEES CONSIDERED SATISFACTORY, *i.e.*, the proportion of the group now employed (not chosen by means of the test) who are considered satisfactory according to present standards (Area $\frac{A+D}{A+B+C+D}$, Chart I).
2. SELECTION RATIO, *i.e.*, the proportion of applicants to be selected by means of the test.
3. r, the validity of the test.
4. PROPORTION SATISFACTORY AMONG THOSE SELECTED, *i.e.*, the proportion of applicants to be selected by means of the test who are expected to be satisfactory according to present standards (Area $\frac{A}{A+B}$, Chart I).

There are eleven tables, corresponding to eleven values of the PROPORTION OF EMPLOYEES CONSIDERED SATISFACTORY, these values being .05, .10, .20, .30, .40, .50, .60, .70, .80, .90, and .95.

The columns of each table correspond to eleven values of the SELECTION RATIO: .05, .10, .20, .30, .40, .50, .60, .70, .80, .90, and .95.

The rows of each table correspond to values of r from .00 to 1.00 by intervals of .05.

The argument of these tables is the PROPORTION SATISFACTORY AMONG THOSE SELECTED.

For example, if .60 or 60% of the present employees are considered satisfactory, and if the best .30 of applicants are to be chosen by means of a test with a validity of .70, then .91, or 91%, of those selected can be expected to be satisfactory. Note that with test validities of zero and unity, the proportions satisfactory among those selected would be .60 and 1.00 respectively.

Tables of the Proportion Who Will be Satisfactory Among Those Selected, for Given Values of the Proportion of Present Employees Considered Satisfactory, the Selection Ratio, and r

Proportion of Employees Considered Satisfactory = .05

r	Selection Ratio .05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
.05	.06	.06	.06	.06	.06	.05	.05	.05	.05	.05	.05
.10	.07	.07	.07	.06	.06	.06	.06	.05	.05	.05	.05
.15	.09	.08	.07	.07	.07	.06	.06	.06	.05	.05	.05
.20	.11	.09	.08	.08	.07	.07	.06	.06	.06	.05	.05
.25	.12	.11	.09	.08	.08	.07	.07	.06	.06	.05	.05
.30	.14	.12	.10	.09	.08	.07	.07	.06	.06	.05	.05
.35	.17	.14	.11	.10	.09	.08	.07	.06	.06	.05	.05
.40	.19	.16	.12	.10	.09	.08	.07	.07	.06	.05	.05
.45	.22	.17	.13	.11	.10	.08	.08	.07	.06	.06	.05
.50	.24	.19	.15	.12	.10	.09	.08	.07	.06	.06	.05
.55	.28	.22	.16	.13	.11	.09	.08	.07	.06	.06	.05
.60	.31	.24	.17	.13	.11	.09	.08	.07	.06	.06	.05
.65	.35	.26	.18	.14	.11	.10	.08	.07	.06	.06	.05
.70	.39	.29	.20	.15	.12	.10	.08	.07	.06	.06	.05
.75	.44	.32	.21	.15	.12	.10	.08	.07	.06	.06	.05
.80	.50	.35	.22	.16	.12	.10	.08	.07	.06	.06	.05
.85	.56	.39	.23	.16	.12	.10	.08	.07	.06	.06	.05
.90	.64	.43	.24	.17	.13	.10	.08	.07	.06	.06	.05
.95	.73	.47	.25	.17	.13	.10	.08	.07	.06	.06	.05
1.00	1.00	.50	.25	.17	.13	.10	.08	.07	.06	.06	.05

Proportion of Employees Considered Satisfactory = .10

r	Selection Ratio .05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
.05	.12	.12	.11	.11	.11	.11	.11	.10	.10	.10	.10
.10	.14	.13	.13	.12	.12	.11	.11	.11	.11	.10	.10
.15	.16	.15	.14	.13	.13	.12	.12	.11	.11	.10	.10
.20	.19	.17	.15	.14	.14	.13	.12	.12	.11	.11	.10
.25	.22	.19	.17	.16	.14	.13	.13	.12	.11	.11	.10
.30	.25	.22	.19	.17	.15	.14	.13	.12	.12	.11	.10
.35	.28	.24	.20	.18	.16	.15	.14	.13	.12	.11	.10
.40	.31	.27	.22	.19	.17	.16	.14	.13	.12	.11	.10
.45	.35	.29	.24	.20	.18	.16	.15	.13	.12	.11	.10
.50	.39	.32	.26	.22	.19	.17	.15	.13	.12	.11	.11
.55	.43	.36	.28	.23	.20	.17	.15	.14	.12	.11	.11
.60	.48	.39	.30	.25	.21	.18	.16	.14	.12	.11	.11
.65	.53	.43	.32	.26	.22	.18	.16	.14	.12	.11	.11
.70	.58	.47	.35	.27	.22	.19	.16	.14	.12	.11	.11
.75	.64	.51	.37	.29	.23	.19	.16	.14	.12	.11	.11
.80	.71	.56	.40	.30	.24	.20	.17	.14	.12	.11	.11
.85	.78	.62	.43	.31	.25	.20	.17	.14	.12	.11	.11
.90	.86	.69	.46	.33	.25	.20	.17	.14	.12	.11	.11
.95	.95	.78	.49	.33	.25	.20	.17	.14	.12	.11	.11
1.00	1.00	1.00	.50	.33	.25	.20	.17	.14	.13	.11	.11

Proportion of Employees Considered Satisfactory = .20
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
.05	.23	.23	.22	.22	.21	.21	.21	.21	.20	.20	.20
.10	.26	.25	.24	.23	.23	.22	.22	.21	.21	.21	.20
.15	.30	.28	.26	.25	.24	.23	.23	.22	.21	.21	.20
.20	.33	.31	.28	.27	.26	.25	.24	.23	.22	.21	.21
.25	.37	.34	.31	.29	.27	.26	.24	.23	.22	.21	.21
.30	.41	.37	.33	.30	.28	.27	.25	.24	.23	.21	.21
.35	.45	.41	.36	.32	.30	.28	.26	.24	.23	.22	.21
.40	.49	.44	.38	.34	.31	.29	.27	.25	.23	.22	.21
.45	.54	.48	.41	.36	.33	.30	.28	.26	.24	.22	.21
.50	.59	.52	.44	.38	.35	.31	.29	.26	.24	.22	.21
.55	.63	.56	.47	.41	.36	.32	.29	.27	.24	.22	.21
.60	.68	.60	.50	.43	.38	.34	.30	.27	.24	.22	.21
.65	.73	.64	.53	.45	.39	.35	.31	.27	.25	.22	.21
.70	.79	.69	.56	.48	.41	.36	.31	.28	.25	.22	.21
.75	.84	.74	.60	.50	.43	.37	.32	.28	.25	.22	.21
.80	.89	.79	.64	.53	.45	.38	.33	.28	.25	.22	.21
.85	.94	.85	.69	.56	.47	.39	.33	.28	.25	.22	.21
.90	.98	.91	.75	.60	.48	.40	.33	.29	.25	.22	.21
.95	1.00	.97	.82	.64	.50	.40	.33	.29	.25	.22	.21
1.00	1.00	1.00	1.00	.67	.50	.40	.33	.29	.25	.22	.21

Proportion of Employees Considered Satisfactory = .30
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30
.05	.34	.33	.33	.32	.32	.31	.31	.31	.31	.30	.30
.10	.38	.36	.35	.34	.33	.33	.32	.32	.31	.31	.30
.15	.42	.40	.38	.36	.35	.34	.33	.33	.32	.31	.31
.20	.46	.43	.40	.38	.37	.36	.34	.33	.32	.31	.31
.25	.50	.47	.43	.41	.39	.37	.36	.34	.33	.32	.31
.30	.54	.50	.46	.43	.40	.38	.37	.35	.33	.32	.31
.35	.58	.54	.49	.45	.42	.40	.38	.36	.34	.32	.31
.40	.63	.58	.51	.47	.44	.41	.39	.37	.34	.32	.31
.45	.67	.61	.55	.50	.46	.43	.40	.37	.35	.32	.31
.50	.72	.65	.58	.52	.48	.44	.41	.38	.35	.33	.31
.55	.76	.69	.61	.55	.50	.46	.42	.39	.36	.33	.31
.60	.81	.74	.64	.58	.52	.47	.43	.40	.36	.33	.31
.65	.85	.78	.68	.60	.54	.49	.44	.40	.37	.33	.32
.70	.89	.82	.72	.63	.57	.51	.46	.41	.37	.33	.32
.75	.93	.86	.76	.67	.59	.52	.47	.42	.37	.33	.32
.80	.96	.90	.80	.70	.62	.54	.48	.42	.37	.33	.32
.85	.99	.94	.85	.74	.65	.56	.49	.43	.37	.33	.32
.90	1.00	.98	.90	.79	.68	.58	.49	.43	.37	.33	.32
.95	1.00	1.00	.96	.85	.72	.60	.50	.43	.37	.33	.32
1.00	1.00	1.00	1.00	1.00	.75	.60	.50	.43	.38	.33	.32

Proportion of Employees Considered Satisfactory = .40
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40
.05	.44	.43	.43	.42	.42	.42	.41	.41	.41	.40	.40
.10	.48	.47	.46	.45	.44	.43	.42	.42	.41	.41	.40
.15	.52	.50	.48	.47	.46	.45	.44	.43	.42	.41	.41
.20	.57	.54	.51	.49	.48	.46	.45	.44	.43	.41	.41
.25	.61	.58	.54	.51	.49	.48	.46	.45	.43	.42	.41
.30	.65	.61	.57	.54	.51	.49	.47	.46	.44	.42	.41
.35	.69	.65	.60	.56	.53	.51	.49	.47	.45	.42	.41
.40	.73	.69	.63	.59	.56	.53	.50	.48	.45	.43	.41
.45	.77	.72	.66	.61	.58	.54	.51	.49	.46	.43	.42
.50	.81	.76	.69	.64	.60	.56	.53	.49	.46	.43	.42
.55	.85	.79	.72	.67	.62	.58	.54	.50	.47	.44	.42
.60	.89	.83	.75	.69	.64	.60	.55	.51	.48	.44	.42
.65	.92	.87	.79	.72	.67	.62	.57	.52	.48	.44	.42
.70	.95	.90	.82	.76	.69	.64	.58	.53	.49	.44	.42
.75	.97	.93	.86	.79	.72	.66	.60	.54	.49	.44	.42
.80	.99	.96	.89	.82	.75	.68	.61	.55	.49	.44	.42
.85	1.00	.98	.93	.86	.79	.71	.63	.56	.50	.44	.42
.90	1.00	1.00	.97	.91	.82	.74	.65	.57	.50	.44	.42
.95	1.00	1.00	.99	.96	.87	.77	.66	.57	.50	.44	.42
1.00	1.00	1.00	1.00	1.00	1.00	.80	.67	.57	.50	.44	.42

Proportion of Employees Considered Satisfactory = .50
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
.05	.54	.54	.53	.52	.52	.52	.51	.51	.51	.50	.50
.10	.58	.57	.56	.55	.54	.53	.53	.52	.51	.51	.50
.15	.63	.61	.58	.57	.56	.55	.54	.53	.52	.51	.51
.20	.67	.64	.61	.59	.58	.56	.55	.54	.53	.52	.51
.25	.70	.67	.64	.62	.60	.58	.56	.55	.54	.52	.51
.30	.74	.71	.67	.64	.62	.60	.58	.56	.54	.52	.51
.35	.78	.74	.70	.66	.64	.61	.59	.57	.55	.53	.51
.40	.82	.78	.73	.69	.66	.63	.61	.58	.56	.53	.52
.45	.85	.81	.75	.71	.68	.65	.62	.59	.56	.53	.52
.50	.88	.84	.78	.74	.70	.67	.63	.60	.57	.54	.52
.55	.91	.87	.81	.76	.72	.69	.65	.61	.58	.54	.52
.60	.94	.90	.84	.79	.75	.70	.66	.62	.59	.54	.52
.65	.96	.92	.87	.82	.77	.73	.68	.64	.59	.55	.52
.70	.98	.95	.90	.85	.80	.75	.70	.65	.60	.55	.53
.75	.99	.97	.92	.87	.82	.77	.72	.66	.61	.55	.53
.80	1.00	.99	.95	.90	.85	.80	.73	.67	.61	.55	.53
.85	1.00	.99	.97	.94	.88	.82	.76	.69	.62	.55	.53
.90	1.00	1.00	.99	.97	.92	.86	.78	.70	.62	.56	.53
.95	1.00	1.00	1.00	.99	.96	.90	.81	.71	.63	.56	.53
1.00	1.00	1.00	1.00	1.00	1.00	1.00	.83	.71	.63	.56	.53

Proportion of Employees Considered Satisfactory = .60
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
.05	.64	.63	.63	.62	.62	.62	.61	.61	.61	.60	.60
.10	.68	.67	.65	.64	.64	.63	.63	.62	.61	.61	.60
.15	.71	.70	.68	.67	.66	.65	.64	.63	.62	.61	.61
.20	.75	.73	.71	.69	.67	.66	.65	.64	.63	.62	.61
.25	.78	.76	.73	.71	.69	.68	.66	.65	.63	.62	.61
.30	.82	.79	.76	.73	.71	.69	.68	.66	.64	.62	.61
.35	.85	.82	.78	.75	.73	.71	.69	.67	.65	.63	.62
.40	.88	.85	.81	.78	.75	.73	.70	.68	.66	.63	.62
.45	.90	.87	.83	.80	.77	.74	.72	.69	.66	.64	.62
.50	.93	.90	.86	.82	.79	.76	.73	.70	.67	.64	.62
.55	.95	.92	.88	.84	.81	.78	.75	.71	.68	.64	.62
.60	.96	.94	.90	.87	.83	.80	.76	.73	.69	.65	.63
.65	.98	.96	.92	.89	.85	.82	.78	.74	.70	.65	.63
.70	.99	.97	.94	.91	.87	.84	.80	.75	.71	.66	.63
.75	.99	.99	.96	.93	.90	.86	.81	.77	.71	.66	.63
.80	1.00	.99	.98	.95	.92	.88	.83	.78	.72	.66	.63
.85	1.00	1.00	.99	.97	.95	.91	.86	.80	.73	.66	.63
.90	1.00	1.00	1.00	.99	.97	.94	.88	.82	.74	.67	.63
.95	1.00	1.00	1.00	1.00	.99	.97	.92	.84	.75	.67	.63
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.86	.75	.67	.63

Proportion of Employees Considered Satisfactory = .70
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70
.05	.73	.73	.72	.72	.72	.71	.71	.71	.71	.70	.70
.10	.77	.76	.75	.74	.73	.73	.72	.72	.71	.71	.70
.15	.80	.79	.77	.76	.75	.74	.73	.73	.72	.71	.71
.20	.83	.81	.79	.78	.77	.76	.75	.74	.73	.71	.71
.25	.86	.84	.81	.80	.78	.77	.76	.75	.73	.72	.71
.30	.88	.86	.84	.82	.80	.78	.77	.75	.74	.72	.71
.35	.91	.89	.86	.83	.82	.80	.78	.76	.75	.73	.71
.40	.93	.91	.88	.85	.83	.81	.79	.77	.75	.73	.72
.45	.94	.93	.90	.87	.85	.83	.81	.78	.76	.73	.72
.50	.96	.94	.91	.89	.87	.84	.82	.80	.77	.74	.72
.55	.97	.96	.93	.91	.88	.86	.83	.81	.78	.74	.72
.60	.98	.97	.95	.92	.90	.87	.85	.82	.79	.75	.73
.65	.99	.98	.96	.94	.92	.89	.86	.83	.80	.75	.73
.70	1.00	.99	.97	.96	.93	.91	.88	.84	.80	.76	.73
.75	1.00	1.00	.98	.97	.95	.92	.89	.86	.81	.76	.73
.80	1.00	1.00	.99	.98	.97	.94	.91	.87	.82	.77	.73
.85	1.00	1.00	1.00	.99	.98	.96	.93	.89	.84	.77	.74
.90	1.00	1.00	1.00	1.00	.99	.98	.95	.91	.85	.78	.74
.95	1.00	1.00	1.00	1.00	1.00	.99	.98	.94	.86	.78	.74
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.88	.78	.74

Proportion of Employees Considered Satisfactory = .80
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80
.05	.83	.82	.82	.82	.81	.81	.81	.81	.81	.80	.80
.10	.85	.85	.84	.83	.83	.82	.82	.81	.81	.81	.80
.15	.88	.87	.86	.85	.84	.83	.83	.82	.82	.81	.81
.20	.90	.89	.87	.86	.85	.84	.84	.83	.82	.81	.81
.25	.92	.91	.89	.88	.87	.86	.85	.84	.83	.82	.81
.30	.94	.92	.90	.89	.88	.87	.86	.84	.83	.82	.81
.35	.95	.94	.92	.90	.89	.89	.87	.85	.84	.82	.81
.40	.96	.95	.93	.92	.90	.89	.88	.86	.85	.83	.82
.45	.97	.96	.95	.93	.92	.90	.89	.87	.85	.83	.82
.50	.98	.97	.96	.94	.93	.91	.90	.88	.86	.84	.82
.55	.99	.98	.97	.95	.94	.92	.91	.89	.87	.84	.82
.60	.99	.99	.98	.96	.95	.94	.92	.90	.87	.84	.83
.65	1.00	.99	.98	.97	.96	.95	.93	.91	.88	.85	.83
.70	1.00	1.00	.99	.98	.97	.96	.94	.92	.89	.85	.83
.75	1.00	1.00	1.00	.99	.98	.97	.95	.93	.90	.86	.83
.80	1.00	1.00	1.00	1.00	.99	.98	.96	.94	.91	.87	.84
.85	1.00	1.00	1.00	1.00	1.00	.99	.98	.96	.92	.87	.84
.90	1.00	1.00	1.00	1.00	1.00	1.00	.99	.97	.94	.88	.84
.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.96	.89	.84
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.89	.84

Proportion of Employees Considered Satisfactory = .90
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90
.05	.92	.91	.91	.91	.91	.91	.91	.90	.90	.90	.90
.10	.93	.93	.92	.92	.92	.91	.91	.91	.91	.90	.90
.15	.95	.94	.93	.93	.92	.92	.92	.91	.91	.91	.90
.20	.96	.95	.94	.94	.93	.93	.92	.92	.91	.91	.90
.25	.97	.96	.95	.95	.94	.93	.93	.92	.92	.91	.91
.30	.98	.97	.96	.95	.95	.94	.94	.93	.92	.91	.91
.35	.98	.98	.97	.96	.95	.95	.94	.93	.93	.92	.91
.40	.99	.98	.98	.97	.96	.95	.95	.94	.93	.92	.91
.45	.99	.99	.98	.98	.97	.96	.95	.94	.93	.92	.91
.50	1.00	.99	.99	.98	.97	.97	.96	.95	.94	.92	.92
.55	1.00	1.00	.99	.99	.98	.97	.97	.96	.94	.93	.92
.60	1.00	1.00	.99	.99	.99	.98	.97	.96	.95	.93	.92
.65	1.00	1.00	1.00	.99	.99	.98	.98	.97	.96	.94	.92
.70	1.00	1.00	1.00	1.00	.99	.99	.98	.97	.96	.94	.93
.75	1.00	1.00	1.00	1.00	1.00	.99	.99	.98	.97	.95	.93
.80	1.00	1.00	1.00	1.00	1.00	1.00	.99	.99	.97	.95	.93
.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.98	.96	.94
.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.97	.94
.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.98	.94
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.95

Proportion of Employees Considered Satisfactory = .95
Selection Ratio

r	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
.00	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
.05	.96	.96	.96	.96	.95	.95	.95	.95	.95	.95	.95
.10	.97	.97	.96	.96	.96	.96	.96	.96	.95	.95	.95
.15	.98	.97	.97	.97	.96	.96	.96	.96	.96	.95	.95
.20	.98	.98	.97	.97	.97	.97	.96	.96	.96	.95	.95
.25	.99	.98	.98	.98	.97	.97	.97	.96	.96	.96	.95
.30	.99	.99	.98	.98	.98	.97	.97	.97	.96	.96	.95
.35	.99	.99	.99	.98	.98	.98	.97	.97	.97	.96	.96
.40	1.00	.99	.99	.99	.98	.98	.98	.97	.97	.96	.96
.45	1.00	1.00	.99	.99	.99	.98	.98	.98	.97	.96	.96
.50	1.00	1.00	1.00	.99	.99	.99	.98	.98	.97	.97	.96
.55	1.00	1.00	1.00	1.00	.99	.99	.99	.98	.98	.97	.96
.60	1.00	1.00	1.00	1.00	1.00	.99	.99	.99	.98	.97	.96
.65	1.00	1.00	1.00	1.00	1.00	1.00	.99	.99	.98	.97	.97
.70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.99	.98	.97
.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.99	.98	.97
.80	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.98	.97
.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.98
.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.98
.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

THE RECOGNITION OF AUTOMOBILE LICENSE PLATES WITH MIXED NUMERALS AND LETTERS*

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THIS experiment was performed to determine the relative efficiency in recognizing antomobile license plates with varying proportions of numerals and consonant letters, where the total number of digits was held to a constant value of five. The problem was suggested by the practice of some states in mixing letters with numerals in order to reduce the total of symbols on each plate, making it possible to increase the size of the letters or numerals and thus improve the effectiveness on attention and memory for an observer trying to identify the cars of law-breakers, or other automobiles being traced.

We here provide a solution for only one of several important problems relative to the conditions which determine the memory value of automobile license plates. We consider that each of these problems must be solved by separate experimental controls:

a. The effect of mixing consonants with numerals, with the least possible effect of word-meaning. This is the subject-matter of the present paper.

b. The effect of mixing vowels with numerals, with meaningful combinations retained.

c. The importance of the absolute number of symbols on a plate.

d. The effect of spacing and grouping symbols. This might involve the use of the *hyphen* in separating symbols.

* Read before Section I, The American Association for the Advancement of Science, Dec. 27, 1938.

e. Color effects.
f. Brightness effects.
g. The importance of type-styles.
h. The effect of duration of exposure.
i. The effect of movement.

Experimental Procedure. Sixty "plates" were prepared by printing Roman capitals and numerals on white cards, photographing these on film slides, and projecting them as white figures on a black background. Figure 1 gives a photographic

FIG. 1. A photographic reproduction of two plates of the style used in this experiment.

reproduction of two such plates. The 60 plates were divided into six "plate-types," each having a different proportion of letters and numerals. The actual symbols used are given in Tables 1 and 2 in which "N" and "L" in the column headings

TABLE 1

Series 1 of the Plates Used as Exposure Numbers for the Subjects in Group A and as Confusion Numbers for the Subjects in Group B. The Heading of Each Column Indicates the Plate-type in Terms of the Proportion of Letters to Numerals.

5N	4N–1L	3N–2L	2N–3L	1N–4L	5L
36598	F5938	9F5Z8	6FH3Z	XH3TF	FTHZX
85639	6H359	38X5T	5H6HF	5FHZX	XZTFH
68395	5896T	T653H	FX9T5	HTZX6	ZXFHT
96853	95Z83	H3F86	Z9T8H	ZFT9H	HFXTZ
59386	398X5	Z68F9	3TXZ8	T8XFZ	TZHXF

stand for "numerals" and "letters" respectively. The projection image on the screen was 14 inches in width. Subjects sat between 10 and 15 feet from the screen. An examination of these two tables shows the following characteristics:

TABLE 2

Series 2 of the Plates Used as Exposure Numbers for the Subjects in Group B and as Confusion Numbers for the Subjects in Group A. The Heading of Each Column Indicates the Plate-type in Terms of the Proportion of Letters to Numerals.

5N	4N–1L	3N–2L	2N–3L	1N–4L	5L
69583	3859H	X6Z38	8HFZ6	TXZ5H	FXZTH
95638	86X39	89T6F	H5F3X	H9ZFT	ZTFHX
53869	938F6	F598X	9XZ5T	FZ6HX	HTXZF
83695	5Z968	H35Z6	6F9ZT	3HTXF	XHZFT
38956	T6385	5H3T9	TZ8X3	XTZF8	TFXHZ

1. The positions of the letters have been assigned an equal number of times, in a set of 10 of the same plate-type, to each of the possible spatial positions on a five-symbol plate.

2. The letters were restricted to a limited number of consonants chosen largely with the intent to reduce word-meaning.

Each set of 10 plates, of a given type, was subdivided into five used for the "exposure" series and five later to be mixed with the exposure series as "confusion plates" in a final test of efficiency of recognition. Eighty subjects of Group A used the plates of Table 1 as the exposure series, and the plates of Table 2 as confusion plates; 74 subjects of Group B reversed the functions of these two tables. The final scores of the two groups, averaged together, thus tended to balance out any presumption that particular parts of a plate-type series might have an unusual status of difficulty. *Every* plate was used as an exposure item for one group and as a confusion item for the other group.

The plates of the exposure series, in each case, were projected before groups of subjects, one at a time, for five seconds. Experimental groups had been told that each of these would be projected later with strange plates (the confusion plates) in a test to see if the exposure plates could be identified. After a five-minute rest each subject was given a mimeographed report form and told to place a "check-mark" in an appropriate space if a plate just seen was one of the exposure series and a

"zero-mark" if the plate just seen was a strange one. The subjects were adequately separated and each group proctored against copying from each other. In the test exposures the plates of Tables 1 and 2 were shuffled and presented, one at a time, for five seconds each.

The subjects were college undergraduates, 154 in all. It was expected that these would be used in groups of about 20 each, the number which could be arranged in front of the screen without any great variation in convenience of seeing the plates. As a matter of fact, conditions affecting the availability of subjects resulted in securing one group with as few as 17 subjects and another with as many as 24 subjects. All sitting positions were carefully scrutinized to see that perfect visibility was possible. We shall show *all* of the data from a predetermined number of readings.

The method of scoring was merely a convenient scale for exhibiting variations of individuals in recognition-success. A score of 10 was given to a subject when the five exposure numbers and the five confusion numbers were correctly indicated. A score of partial success was given by subtracting the number of errors from the number of correctly identified plates. Most of the subjects used the knowledge, given to all, that there were always five familiar plates and five strange plates in each test series, and they tended to give exactly five responses as for familiar plates, and five responses as for strange plates, guessing if necessary. (Since we are interested in *comparative* values of plate-types, it is not here necessary to define what constitutes "pure chance.") It will be obvious that this method of scoring tended to throw concentrations of cases on –6, –2, 2, 6, and 10 scores. However, a few subjects did persist in reporting more or less than five "familiar" plates. This is why our data will show a few scores in the denominations of –4, 0, 4 and 8. Obviously, odd-numbered scores were impossible.

Psychologists will recognize the possibility that in such an experiment as this learning may be affected by *temporal position in the exposure series,* and that we must be certain that the

apparent value of a given plate-type is not due to its temporal position. On the one hand, fatigue, boredom, lack of motivation, or perhaps generative inhibition might produce a gradual loss of efficiency. On the other hand, acquisition of skill or increases in motivation might conceivably increase efficiency as the experiment progresses. It is important, therefore, that we present data in such a manner that we can show that the recognition-value of given plate-types is not due to accidents of temporal position in the series.

We shall indicate two methods of dealing with the matter of the temporal factors. First, the 154 subjects were subdivided into smaller groups, each of which started and ended on a *different* plate type. Ideally, these small groups should have been arranged in exactly equal numbers of subjects, but conditions affecting the availability of subjects made it impossible to secure perfect balancing. Second, we shall arrange the final scores, *tabulated by position in the learning series,* to indicate the actual temporal influences in this experiment. The sectioning of the 154 subjects was accomplished as follows: 20 subjects began on 5N and ended on 5L; 24 subjects began on 4N–1L and ended on 5N; 19 subjects began on 3N–2L and ended on 4N–1L; 18 subjects began on 2N–3L and ended on 3N–2L; 39 subjects began on 1N–4L and ended on 2N–3L; and 34 subjects began on 5L and ended on 1N–4L. Table 3 shows the average score for each temporal position, all plate-types mixed.

TABLE 3

The Frequency of Recognition Scores Tabulated by Position in the Exposure Series, Each Position Having All Plate-types Mixed Together

	SCORES									
Position	–6	–4	–2	0	2	4	6	8	10	Mean
First	1	2	16	8	47	8	54	8	10	3.70
Second		4	19	5	44	14	50	6	12	3.62
Third	2	3	20	7	40	7	57	6	12	3.60
Fourth			10	5	49	17	50	2	21	4.36
Fifth	1	1	17	6	41	9	63	3	13	3.93
Sixth	1	1	15	11	47	5	43	7	24	4.08

Results. An examination of the table just mentioned shows that there was no very great shift in recognition-efficiency as the experiment progressed. The right-hand graph in Figure 2 shows a high place over the fourth position in the learning series, and this increase is so small as to be of doubtful statistical reliability. When compared with the left-hand graph, where recognition efficiency is plotted against plate-types, certainly it is impossible to explain the differences in plate-types on the basis of accidental position and unequal weighting in the temporal series.

Table 4 gives the frequency distributions of scores tabulated

TABLE 4

The Frequency of Recognition Scores Tabulated by Plate-types, Each Type Having All the Learning Positions Mixed Together.

	SCORES											
Plate-type	−6	−4	−2	0	2	4	6	8	10	Mean	S.D.	% above Diff. Slope
5N		3	23	7	50	10	46	3	12	3.26	3.52	0
4N–1L	1	1	6	2	31	10	69	7	27	5.32	3.24	73.9
3N–2L	1	2	6	7	46	6	61	8	17	4.48	2.98	56.6
2N–3L			15	5	45	11	62	6	10	4.05	3.12	52.4
1N–4L	3	3	11	9	46	16	37	7	22	3.91	4.10	58.9
5L		2	36	12	50	7	42	1	4	3.26	3.26	0

by plate-types, with means, standard deviations (given to exhibit statistical reliability), and per cent above the difficulty slope. The left-hand graph of Figure 2 plots the mean of each plate-type against the combination of letters and numerals. The broken line is drawn to indicate the fact that there seemed to be a distinctly greater difficulty for pure letters as compared with pure numerals and we speak of this as the "difficulty slope." "Per cent above the difficulty slope" in Table 4 is computed by dividing the height-above-the-slope by the height of the slope above the baseline or zero score. This is done to present the *effect of mixing* letters with numerals, independent of the *difference in difficulty*, for the two kinds of symbols.

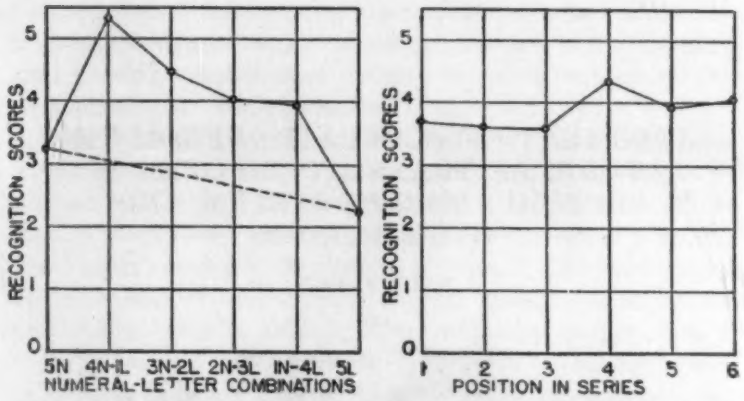

FIG. 2. On the left, the efficiency of recognition plotted against combinations of letters with figures. The broken line is drawn to indicate the demonstrated increase of difficulty when pure letters were used. On the right, the efficiency of recognition plotted against position in the learning series, as a control for the temporal factors of learning.

The following is a summary of our conclusions:

1. Pure letters were harder to recognize than pure numerals, for plates with five symbols.

2. Mixtures of letters with numerals were easier to recognize than either pure letters or pure numerals.

3. The peculiar symmetry of the curve suggests that 1–to–4 combinations are slightly better than 2–to–3 combinations, but this may be of doubtful statistical reliability.

JUDGMENT OF OCCUPATION FROM THE VOICE AS TRANSMITTED OVER A PUBLIC ADDRESS SYSTEM AND OVER A RADIO

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AND

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THIS study represents an attempt to discover to what extent, if any, speakers over a public address system and over a radio can be identified by listeners as belonging to one or another of five different occupations. Also, an attempt is made to discover whether, judging solely from the voice, occupational stereotypes exist.

A definite distinction must be drawn between voice and speech. Sapir (7) has emphasized the role that conditioning plays in specific vocal responses. Because of social conditioning an individual speaks with a certain intensity range, a certain rate, etc. Stagner suggests that the "analyzed 'voice as a whole' in all its gestaltian purity may be a cue for judgments of personality" (8, p. 276). Voice is expressive movement, comprising vocal mannerisms, inflection, pitch, intensity, volume, and rhythm. Speech, on the other hand, is the content of vocal expression, comprising vocabulary, style of composition, and dialect.

In the present experiments, which are solely concerned with voice, cultural cues were held constant as far as possible. There were no noticeable differences in the accents or dialects of the speakers, most of whom were from Indiana, or states adjoining. In one of the experiments three innocuous interview questions were asked each speaker preceding the reading of the experi-

mental material; in the other experiment individual differences in speech were practically excluded, inasmuch as the speakers read materials which were equated for style, subject-matter, vocabulary and vocal expression.

Very few experimental studies have been made of the problem of stereotyped voices. To be sure, the majority of people undoubtedly believe that there are voice stereotypes that can be readily recognized; thus we speak of the "preacher's voice," the "actor's voice," the "artist's voice," the "politician's voice." Allport and Cantril suggest that "probably most people who listen to radio speakers feel assured that some of their judgments are dependable" (1, p. 37). We describe a radio voice as being nervous, sociable, egotistical, self-confident, or dominant. Pear, a pioneer in demonstrating that certain qualities can be judged from the radio voice with considerable accuracy, writes: "Judging from the readiness with which most people judge voices, one might assume that there would be well-known classifications into types. If so, they are hard to find" (6, p. 7). However, he says that in England "a person's voice often conforms to a stereotype" (6, p. 28). He speaks of an "army officer's voice" and he believes that the stage breeds, and perhaps inbreeds, stereotypes. Pear predicts that, with the widespread interest in voices on the stage and in the talking film, types may be created. In England, he says, many educational institutions encourage their pupils to speak in a certain way. In this regard, of course, he speaks only for England; he does not imply that the same type of speech conditioning exists in other countries.[1] Pear is of the opinion that the phenomenon of synesthesis plays some part in the effect that any particular voice may have upon a listener. "Voices have effects not only directly upon hearing, but also, in a queer way, upon memories from the other senses, or even perhaps upon the other senses themselves" (6, p. 7).

[1] Indeed, there may be more reason for assuming the existence of voice stereotypes in England than in the United States, since in the latter country there is less likelihood of being able to distinguish social classes on the basis of speech.

As stated previously, comparatively few experimental studies have been made on the relationship between voice and specific personality qualities. In some experiments speakers have been presented over a radio or a public address system; in others, no mechanical aids have been used. The authors, in another publication (4), have reviewed in some detail the results of several of these experiments. Pear (6), Herzog (5), Allport and Cantril (1, 3), and Taylor (9) have reported studies in which mechanical or electrical aids in voice transmission were used; Bonaventura (2) and Stagner (8) have reported studies in which no apparatus was employed.

Pear, through the facilities of the British Broadcasting Company, used nine speakers of different sex, age, and interests. He secured 4,000 listeners' judgments concerning the birthplace, age, occupation and place of residence of each of these nine speakers. Pear found both consistency of correct judgments and consistency of errors in judgments concerning occupation. Although his results are difficult to quantify, he found that vocation was occasionally judged with a surprising degree of correctness. However, he does not conclude definitely that there are specific, clear-cut *types* of voices.

Herzog (5) had radio listeners in Vienna judge the occupation (along with the height, weight, age and sex) of each of several radio speakers. Replies were elicited from 2,700 auditors. She found that occupation was judged more accurately than one might expect from the mere operation of chance.

Allport and Cantril (1, 3), as a part of fourteen experiments on the judgment of personality qualities from voice, attempted to discover to what extent speakers over a public address system and over a radio could be identified by listeners as belonging to a certain occupation. In the main part of the investigation, six experiments were performed in the Harvard Psychological Laboratory, where a complete public address system had been installed; two were conducted over Station WEEI, Boston. In the laboratory experiments, the number of student judges ranged from 32 to 85; in the WEEI experiments, 285 listeners

sent in replies. Allport and Cantril found that vocation was occasionally stated with rather surprising accuracy. Three of their experiments yielded significantly positive results, while one was significantly negative. The largest coefficient of correct matching was 24.5. In this experiment one speaker was an artist, one a business man, and one a professor. Negative results were secured in the experiment in which one speaker was a professor of English, one a journalist and one a psychologist, a native of South Africa, with an apparently "English accent." The latter was consistently judged to be a professor of English. Allport and Cantril say: "It is evident that the auditors have decided opinions concerning the kinds of voices which are typical of the various professions. Such preconceptions are frequently, though by no means invariably, correct" (1, p. 45).

METHOD

The present study on the judgment of occupation from voice consists of two experiments, one performed over a public address system in the DePauw Psychological Laboratory (Experiment No. 1), the other over Station WIRE, Indianapolis (Experiment No. 2). In another publication (4), the authors have described their apparatus and experimental set-up in detail. With the aid of modern public address system equipment, high fidelity voice transmission was achieved.

Ten male speakers were used, all of whom were professional and business men unknown to the listeners. Two speakers represented each of the following occupations: preacher, teacher, lawyer, insurance agent and musician. The speakers ranged in age from 30 to 65 years (average age about 45 years). Each speaker read over the public address system a paragraph which took approximately 45 seconds to read. The materials were chosen from current magazines, and were selected for their simplicity, readability, and interest value. In order to avoid boredom on the part of the listeners, three kinds of copy were used, and transcribed music was played for about 30 seconds between each two readings. In order to avoid "mike fright," the speakers practiced reading into the micro-

phone before the experiment; they were not permitted, however, to practice reading the experimental material. They were not told the purpose of the experiment; artificial changes in voice were thus avoided. During the experiment the audition director checked on volume of the speakers' voices and signaled to the control room technician if the volume was not properly equated.

The listeners were 47 students (23 men and 24 women) in a regular psychology class. They were not asked to sign their names on their answer sheets. The listeners were asked by the announcer to write on a sheet of paper, previously supplied by the audition director, the names of the five occupations. They were then asked to write the numbers from 1 to 10 in a column on the answer sheet, leaving enough space after each number to write the names of the occupations to be judged. The announcer always gave the number of each voice before and after the reading of each selection. The order of presentation of the ten speakers, according to their occupations, was: lawyer, preacher, musician, insurance agent, preacher, lawyer, insurance agent, teacher, musician and teacher.

Experiment No. 2, on judging occupation from voice over the 5,000-watt facilities of Station WIRE, Indianapolis, was conducted in most essential respects in the same manner as the laboratory experiment over the P. A. system. The experiment lasted 15 minutes, and was broadcast at 9:45 o'clock on a Sunday evening during March, 1938. The broadcast began with transcribed music, after which the announcer explained the purpose and nature of the experiment, and informed the listeners of the five occupational categories into which the speakers could be classified. At the conclusion of the experiment the auditors were asked to copy their answers on a postal card and send the card to the radio station. Forty-three listeners (23 men and 20 women) replied; the age range was from 18 to 71.

The five speakers were residents of the city of Indianapolis. The authors have no way of knowing whether the voice of any speaker was recognized by any listener. However, inasmuch

as over 85 per cent of the answers came from outside the city of Indianapolis, one may assume that the factor of recognition is not significant. There was one representative of each of the following occupations: preacher, musician, lawyer, detective and taxi driver. The speakers were presented in the order named. Each speaker was first asked three innocuous interview questions (questions the same for each speaker). Each one also read a paragraph, selected on the basis of simplicity and interest value; he was allowed to practice reading the material for about five minutes before the broadcast began. Inasmuch as the participants knew the purpose of the experiment, the authors cannot be sure that artificial changes in voice were avoided. Each speaker was merely told: "Be yourself. Speak with your natural voice."

RESULTS AND DISCUSSION

In Experiment No. 1, the percentage of listeners rating each of 10 speakers over the P. A. system in each of 5 occupational categories is shown in Table I. The difference between the percentages of listeners rating each of the speakers in each of the occupational categories and chance percentage (20%) is shown in Table II. It will be noted from Table I that the mean percentages of male listeners are superior to those of female listeners in correctly identifying the following occupations: teacher (male, 26%; female, 21%); lawyer (male, 26%; female, 12%); musician (male, 20%; female, 6%). The mean percentages of female listeners are superior to those of male listeners in correctly identifying the following occupations: preacher (female, 23%; male, 20%); insurance agent (female, 21%; male, 15%).

Tables I and II show that the two preachers are identified 1 per cent better than chance by the total number of listeners. Speaker "Ra" is judged to be a preacher by 6 per cent of the listeners, while Speaker "Fe" is judged to be a preacher by 36 per cent. The mean percentage of total listeners' ratings for the two preachers is lowest for the musician and insurance

TABLE I

Percentage of Listeners Rating Each of Ten Speakers Over a Public Address System in Each of Five Occupations

Actual occupation of speakers	Speaker[a]	Order of speaking[b]	Percentage of speakers rated in each occupation by listeners														
			Preacher			Teacher			Lawyer			Insurance agent			Musician		
			M[c]	F[d]	T[e]	M[c]	F[d]	T[e]	M[c]	F[d]	T[e]	M[c]	F[d]	T[e]	M[c]	F[d]	T[e]
Preacher	Ra	2	13	0	6	39	21	30	26	54	40	17	25	21	4	4	4
	Fe	5	26	46	36	30	17	23	17	21	19	4	8	6	22	12	17
	Mean[f]		20	23	21	34	19	26	22	38	30	10	16	14	13	8	10
Teacher	Bi	8	4	8	6	22	21	21	9	12	11	26	21	23	39	42	40
	Hag	10	17	12	15	30	21	26	17	4	11	22	25	23	13	42	28
	Mean[f]		10	10	10	26	21	24	13	8	11	24	23	23	26	42	34
Lawyer	Ha	1	30	58	45	22	12	17	26	4	15	22	8	15	0	21	11
	Su	6	39	46	43	9	21	15	26	21	23	13	0	6	13	17	15
	Mean[f]		34	52	44	16	16	16	26	12	19	18	4	10	6	19	13
Insurance agent	Co	4	4	4	4	9	8	9	9	29	19	26	25	26	52	38	45
	Sa	7	61	25	43	17	29	23	9	8	9	4	17	11	9	25	17
	Mean[f]		32	20	24	13	18	16	9	18	14	15	21	18	30	32	31
Musician	Th	3	4	4	4	17	29	23	17	8	13	43	58	51	17	4	11
	Ko	9	0	4	2	13	33	23	43	46	45	22	12	17	22	8	15
	Mean[f]		2	4	3	15	31	23	30	27	29	32	35	34	20	6	13

[a] The code letters of speakers are devised by using the first two or three letters of their names.

[b] The numbers indicate the order in which the speakers were presented. For example, "Ha" was presented first, "Ra," second, etc.

[c] Refers to male listeners (N = 23).

[d] Refers to female listeners (N = 24).

[e] Refers to total number of listeners (N = 47).

[f] The mean percentage rating of the two speakers in each occupational category by the listeners.

TABLE II

Differences between Percentages of Listeners Rating Each of Ten Speakers Over a Public Address System in Each of Five Occupations and Chance Percentage

TABLE 11

Differences between Percentages of Listeners Rating Each of Ten Speakers Over a Public Address System in Each of Five Occupations and Chance Percentage

Actual occupation of speakers	Speaker[b]	Percentage chances of being rated in any one occupation	Percentage difference[a] between listeners' ratings of speakers and chance													
			Preacher			Teacher			Lawyer			Insurance agent			Musician		
			M[c]	F[d]	T[e]	M[c]	F[d]	T[e]	M[c]	F[d]	T[e]	M[c]	F[d]	T[e]	M[c]	F[d]	T[e]
Preacher	Ra	20	− 7	−20	−14	+19	+ 1	+10	+ 6	+34	+20	− 3	+ 5	+ 1	−16	−16	−16
	Fe	20	+ 6	+26	+16	+10	− 3	+ 3	− 3	+ 1	− 1	−16	−12	−14	+ 2	− 8	− 3
	Mean[f]	20	0	+ 3	+ 1	+14	− 1	+ 6	+ 2	+18	+10	−10	− 4	− 6	− 7	−12	−10
Teacher	Bi	20	−16	−12	−14	+ 2	+ 1	+ 1	−11	− 8	− 9	+ 6	+ 1	+ 3	+19	+22	+20
	Hag	20	− 3	− 8	− 5	+10	+ 1	+ 6	− 3	−16	− 9	+ 2	+ 5	+ 3	− 7	+22	+ 8
	Mean[f]	20	−10	−10	−10	+ 6	+ 1	+ 4	− 7	−12	− 9	+ 4	+ 3	+ 3	+ 6	+22	+14
Lawyer	Ha	20	+10	+38	+25	+ 2	− 8	− 3	+ 6	−16	− 5	+ 2	−12	− 5	−20	+ 1	− 9
	Su	20	+19	+26	+23	−11	+ 1	− 5	+ 6	+ 1	+ 3	− 7	−20	−14	− 7	− 3	− 5
	Mean[f]	20	+14	+32	+24	− 4	− 4	− 4	+ 6	− 8	− 1	− 2	−16	−10	−14	− 1	− 7
Insurance agent	Co	20	−16	−16	−16	−11	−12	−11	−11	+ 9	− 1	+ 6	+ 5	+ 6	+32	+18	+25
	Sa	20	+41	+ 5	+23	− 3	+ 9	+ 3	−11	−12	−11	−16	− 3	− 9	−11	+ 5	− 3
	Mean[f]	20	+12	0	+ 4	− 7	− 2	− 4	−11	− 2	− 6	− 5	+ 1	− 2	+10	+12	+11
Musician	Th	20	−16	−16	−16	− 3	+ 9	+ 3	− 3	−12	− 7	+23	+38	+31	− 3	−16	− 9
	Ko	20	−20	−16	−18	− 7	+13	+ 3	+23	+26	+25	+ 2	− 8	− 3	+ 2	−12	− 5
	Mean[f]	20	−18	−16	−17	− 5	+11	+ 3	+10	+ 7	+ 9	+12	+15	+14	0	−14	− 7

[a] If the percentage of listeners rating a speaker in a given occupation is greater than chance percentage (20), the difference between the two percentages is preceded by a plus (+) sign. If the percentage of listeners rating a speaker is less than chance percentage, the difference between the two percentages is preceded by a minus (−) sign.

[b] The code letters of speakers are devised by using the first two or three letters of their names.

[c] Refers to male listeners (N = 23).

[d] Refers to female listeners (N = 24).

[e] Refers to total number of listeners (N = 47).

[f] The mean percentage difference between listeners' ratings and chance for the two speakers in each occupational category.

agent occupational categories; it is highest for the lawyer, teacher and preacher occupational categories.

The two teachers are identified 4 per cent better than chance by the total number of listeners. Speaker "Bi" is judged to be a teacher by 21 per cent of the listeners, while Speaker "Hag" is judged to be a teacher by 26 per cent. The mean percentage of total listeners' ratings for the two teachers is lowest for the preacher and lawyer occupational categories; it is highest for the musician, teacher, and insurance agent occupational categories.

The two lawyers are identified 1 per cent less than chance by the total number of listeners. Speaker "Ha" is judged to be a lawyer by 15 per cent of the listeners, while Speaker "Su" is judged to be a lawyer by 23 per cent. The mean percentage of total listeners' ratings for the two lawyers is lowest for the insurance agent, musician, and teacher occupational categories; it is highest for the preacher and lawyer occupational categories (especially for the former).

The two insurance agents are identified 2 per cent less than chance by the total number of listeners. Speaker "Co" is judged to be an insurance agent by 26 per cent of the listeners, while Speaker "Sa" is judged to be an insurance agent by 11 per cent. The mean percentage of total listeners' ratings for the two insurance agents is lowest for the lawyer, teacher, and insurance agent occupational categories; it is highest for the musician and preacher occupational categories.

The two musicians are identified 7 per cent less than chance by the total number of listeners. Speaker "Th" is judged to be a musician by 11 per cent of the listeners, while Speaker "Ko" is judged to be a musician by 15 per cent. The mean percentage of total listeners' ratings for the two musicians is lowest for the preacher and musician occupational categories; it is highest for the insurance agent and teacher occupational categories.

Table II definitely indicates that certain voices are stereotypes; they impress a rather large percentage of listeners as being the voices of persons who could be classified in a particu-

lar occupational category. Speakers "Fe" (preacher), "Ha" (lawyer), "Su" (lawyer), and "Sa" (insurance agent) appear to be preacher stereotypes. Speakers "Ra" (preacher) and "Ko" (musician) are lawyer stereotypes. Speaker "Th" (musician) is an insurance agent stereotype. Speakers "Bi" (teacher) and "Co" (insurance agent) are musician stereotypes. There is a tendency for the listeners to confuse the preacher and lawyer voices. There seems to be no clear-cut teacher stereotype among the voices used.

In Experiment No. 2, the percentage of listeners rating each of 5 speakers over the radio in each of 5 occupational categories is shown in Table III. The differences between the percentages of listeners rating each of the speakers in each of the occupational categories and chance percentage (20%) is shown in Table IV. It will be noted from Table III that the percentages of male listeners are superior to those of female listeners in correctly identifying the following occupations: preacher (male, 48%; female, 45%); musician (male, 35%; female, 5%); taxi driver (male, 13%; female, 0%). The percentages of female listeners are superior to those of male listeners in correctly identifying the following occupations: lawyer (female, 55%; male, 30%); detective (female, 15%; male, 9%).[2]

Tables III and IV show that the preacher is identified 27 per cent better than chance by the total number of listeners. The percentage of listeners' ratings of the preacher's voice is lowest for the musician, detective, and taxi driver occupational categories; it is highest for the preacher and lawyer occupational categories.

[2] Of the 20 female auditors, none got as many as 4 or 5 judgments right, 4 got 3 right, 5 got 2 right, 3 got 1 right, and 8 got none right. They judged the lawyer right 9 times, the preacher 8 times, the detective 3 times, the musician 1 time, and the taxi driver 0 times. Of the 23 male radio auditors, 1 got all 5 judgments right, none got as many as 4 right, 4 got 3 right, 1 got 2 right, 10 got 1 right, and 7 got none right. They judged the preacher right 11 times, the musician 8 times, the lawyer 5 times, the taxi driver 3 times, and the detective 2 times.

TABLE III

Percentage of Listeners Rating Each of Five Speakers Over a Radio in Each of Five Occupations

Actual occupation of speaker	Speaker[a]	Order of speaking	Percentage of speakers rated in each occupation by listeners														
			Preacher			Musician			Lawyer			Detective			Taxi driver		
			M[b]	F[c]	T[d]	M[b]	F[c]	T[d]	M[b]	F[c]	T[d]	M[b]	F[c]	T[d]	M[b]	F[c]	T[d]
Preacher	Da	1	48	45	47	4	5	5	43	25	35	4	10	7	0	15	7
Musician	Mi	2	9	20	14	35	5	21	17	10	14	13	40	26	26	25	26
Lawyer	Br	3	30	30	30	4	5	5	30	55	42	30	10	21	4	0	2
Detective	Fa	4	4	5	5	35	20	28	0	0	0	9	15	12	52	60	56
Taxi driver	Bu	5	13	5	9	22	65	42	13	5	9	39	25	33	13	0	7

[a] The code letters of speakers are devised by using the first two or three letters of their names.

[b] Refers to male listeners (N = 23).

[c] Refers to female listeners (N = 20).

[d] Refers to total number of listeners (N = 43).

TABLE IV

Differences between Percentages of Listeners Rating Each of Five Speakers Over a Radio in Each of Five Occupations and Chance Percentage

Actual occupation of speaker	Speaker[b]	Percentage chances of being rated in any one occupation	Percentage differences[a] between listeners' ratings of speakers and chance													
			Preacher			Musician			Lawyer			Detective			Taxi driver		
			Mc	Fd	Te	Mc	Fd	Te	Mc	Fd	Te	Mc	Fd	Te	Mc	Fd	Te
Preacher	Da	20	+28	+25	+27	−16	−15	−15	+23	+ 5	+15	−16	−10	−13	−20	− 5	−13
Musician	Mi	20	−11	0	− 6	+15	−15	+ 1	− 3	−10	− 6	− 7	+20	+ 6	+ 6	+ 5	+ 6
Lawyer	Br	20	+10	+10	+10	−16	−15	−15	+10	+35	+22	+10	−10	+ 1	−16	−20	−18
Detective	Fa	20	−16	−15	−15	+15	0	+ 8	−20	−20	−20	−11	− 5	− 8	+32	+40	+36
Taxi driver	Bu	20	− 7	−15	−11	+ 2	+45	+22	− 7	−15	−11	+19	+ 5	+13	− 7	−20	−13

[a] If the percentage of listeners rating a speaker in a given occupation is greater than chance percentage (20), the difference between the two percentages is preceded by a plus (+) sign. If the percentage of listeners rating a speaker is less than chance percentage, the difference between the two percentages is preceded by a minus (−) sign.

[b] The code letters of speakers are devised by using the first two or three letters of their names.

[c] Refers to male listeners (N = 23).

[d] Refers to female listeners (N = 20).

[e] Refers to total number of listeners (N = 43).

The musician is identified only 1 per cent better than chance by the total number of listeners. The percentage of listeners' ratings of the musician's voice is lowest for the preacher and lawyer occupational categories; it is highest for the detective, taxi driver, and musician occupational categories.

The lawyer is identified 22 per cent better than chance by the total number of listeners. The percentage of listeners' ratings of the lawyer's voice is lowest for the taxi driver and musician occupational categories; it is highest for the lawyer, preacher and detective occupational categories.

The detective is identified 8 per cent less than chance by the total number of listeners. The percentage of listeners' ratings of the detective's voice is lowest for the lawyer, preacher, and detective occupational categories; it is highest for the taxi driver and musician occupational categories.

The taxi driver is identified 13 per cent less than chance by the total number of listeners. The percentage of listeners' ratings of the taxi driver's voice is lowest for the taxi driver, preacher, and lawyer occupational categories; it is highest for the musician and detective occupational categories.

Table IV definitely indicates that certain voices are stereotypes. Speaker "Da" (preacher) appears to be a preacher stereotype; Speaker "Bu" (taxi driver), a musician stereotype; Speaker "Br" (lawyer), a lawyer stereotype; Speaker "Fa" (detective), a taxi driver stereotype. There is, as in the case of Experiment No. 1, a tendency for the listeners to confuse the preacher and lawyer voices. There seems to be no clear-cut detective stereotype among the voices used. Ranked on the basis of accuracy with which the occupations of the five radio speakers are judged, the order is: preacher, lawyer, musician, detective, taxi driver.

As indicated previously, the two occupations in both experiments which are most often confused are the preacher and lawyer. This might be expected. Men in these two professions are probably more practiced in formal public speaking than are representatives of the other occupations; hence, their voices are

likely to become stereotyped to a certain extent. This may be especially true of the preacher. Pear believes that there are certain qualities which "may fairly be required in a preacher's voice" (6, p. 78). He states that there is a "standardized preacher's voice" which may carry "intonations of awe and reverence." "We can assume," he says, "that what is meant when the 'parson's voice' is spoken of inimically, is a voice very different from those of persons of the same district and social class, even of his own family" (6, p. 81). To be sure, Pear is referring specifically to English clergymen, who are affiliated, for the most part, with churches that are essentially liturgical; his conclusions, therefore, may not apply to ministers of the various evangelical faiths in the United States. Nevertheless, the present studies offer evidence of the fact that *some* ministers' voices are *somewhat* stereotyped. The same may be said, perhaps to a lesser extent, of the voices of *some* lawyers, especially those of trial lawyers. Many attorneys, of course, seldom if ever appear in a court room to make a formal pleading of a case and we may assume that these "office" lawyers are not likely to develop a characteristic "lawyer's voice."

The results of these experiments are significant for radio broadcasting. From a practical standpoint, the results indicate that certain voices seem to be those of persons who could be classified into a particular occupation by a rather large percentage of listeners. Use could, therefore, be made of stereotyped voices in broadcasting of plays and in the dramatization of news events. The casting of characters, frequently done very ineffectively, could thus be greatly improved. For example, in broadcasting a dramatic sketch in which a minister has a part to play, the speaker for such a part could be chosen because of his stereotyped "preacher's voice." Actually, of course, the speaker need not be a minister. The *actual* occupation of the speaker is obviously of no importance, since in the field of radio broadcasting, as in the field of theatrics, the chief objective is to *create* a certain type and to *produce* a certain effect. The creation of "types" is of especial importance in radio broadcasting, where visual cues are absent.

SUMMARY

The results of these experiments are purely tentative and are subject to sampling limitations of the size of the number of speakers and of the number of listeners.

1. In judging occupations from the voices of speakers, as heard both over a public address system and over a radio, male listeners are slightly superior to female listeners.

2. The representatives of certain occupations who are judged better than chance (in terms of mean percentages) from hearing their voices over a public address system are preachers and teachers. The representatives of certain occupations who are judged less accurately than chance are lawyers, insurance agents and musicians.

3. The representative of certain occupations who is judged better than chance from hearing his voice over a radio is the preacher, the musician and the lawyer. The representative of certain occupations who is judged less accurately than chance is the detective and the taxi driver.

4. Ranked on the basis of accuracy with which the occupations of ten public address system speakers are judged, the order is teacher, preacher, lawyer, insurance agent and musician.

5. Ranked on the basis of accuracy with which the occupations of five radio speakers are judged, the order is preacher, lawyer, musician, detective, taxi driver.

6. Certain voices are stereotypes; they definitely impress a rather large percentage of listeners as being the voices of persons who could be classified in a particular occupational category. Other voices are not stereotypes; there is little consistency in judging them.

7. There is a tendency for listeners to confuse the voices of preachers and lawyers, both as they are heard over the public address system and over the radio.

8. Practical use can be made of stereotyped voices in the broadcasting of dramatic materials over the radio. The casting of characters can thus be greatly improved and a more desirable effect produced on the audience.

REFERENCES

1. ALLPORT, G. W., AND CANTRIL, H. Judging personality from voice. *J. Soc. Psychol.*, 1934, *5*, 37–55.
2. BONAVENTURA, M. Ausdruck der Persönlichkeit in der Sprechstimme und im Photogramm. *Arch. ges. Psychol.*, 1935, *94*, 501–570.
3. CANTRIL, H., AND ALLPORT, G. W. The psychology of radio. New York: Harper and Brothers, 1935. Pp. 276.
4. FAY, P. J., AND MIDDLETON, W. C. Judgment of Kretschmerian body types from the voice as transmitted over a public address system. *J. Soc. Psychol.* (in press).
5. HERZOG, H. Stimme und Persönlichkeit. *Zsch. f. Psychol.*, 1933, *130*, 300–379.
6. PEAR, T. H. Voice and personality. New York: John Wiley and Sons, 1931. Pp. 247.
7. SAPIR, E. Speech as a personality trait. *Amer. J. Sociol.*, 1927, *32*, 892–905.
8. STAGNER, R. Judgments of voice and personality. *J. Educ. Psychol.*, 1936, *27*, 272–277.
9. TAYLOR, H. C. Social agreement on personality traits as judged from speech. *J. Soc. Psychol.*, 1934, *5*, 244–248.

SCHOLASTIC ACCOMPLISHMENT AS AFFECTED BY INTELLIGENCE AND PARTICIPATION IN EXTRA-CURRICULAR ACTIVITIES

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SEVEN hundred high-school students just completing their fourth year of high school were examined for a study of the relationship between intelligence and scholarship. When a correlation of less than $r = .50$ was found between intelligence quotients and school grades, it was thought necessary to investigate further the possible reason for such a low relationship. Intensive participation in extra-curricular activities was considered to be one possible reason accounting for the fact that some pupils with high IQ's earned low school grades.

Scholarship scores were based upon the average of school grades received thruout the entire four years of high school. Intelligence scores were obtained by the Otis Higher Examination. The study was carried on mainly by decile rank in the intelligence and scholarship scores.

The underlying assumption was that a student's scholarship rank should fall at or near his rank in intelligence. A student whose intelligence quotient fell in the first decile of the group should rank near the top decile in scholarship; otherwise, there must be some external reason for the change in decile rank. A student whose intelligence quotient fell in the lower deciles should not be as likely to rank high in scholarship unless great effort had been expended. In such cases as the latter, it is possible that the student's entire attention had been given to his studies to the exclusion of extra-curricular activities which might detract from the time needed for school work.

Upon this assumption, the study was conducted by the evaluation of decile rank in scholarship in terms of the decile rank in intelligence, and the change in these two decile ranks compared with leadership scores based upon participation in extra-curricular offices held. A change of decile rank in scholarship to a small extent is to be expected as a matter of chance distribution; therefore, changes of ± 1 decile were considered unimportant.

It was found that 17 per cent of the girls and 16 per cent of the boys fell into the same decile in scholarship as in intelligence. Thirteen per cent of the girls and 12 per cent of the boys gained one decile in scholarship over their decile rank in intelligence. Eleven per cent of the girls and 12 per cent of the boys lost one decile in scholarship from their decile rank in intelligence. Thus, approximately 40 per cent of each sex group ranked in scholarship in the same or near the same decile as in intelligence. Sixty per cent lost or gained in scholarship more than one decile from their rank in intelligence. A few students gained as much as seven or eight deciles, while a few students lost as much as nine deciles. This would mean that almost one per cent of the students ranking in the top decile in intelligence fell to the lowest decile in scholarship. Nearly 10 per cent gained or lost five deciles or more. There must be some explanation for such a difference between rank in scholarship and in intelligence. Participation in extra-curricular activities was investigated as one possible reason for these great differences.

It may be seen from Table 1 that it is not at any one part of the intelligence distribution that great changes are made in scholarship rank. In each decile of intelligence approximately the same percentage of students changed rank in scholarship. In the lower ranks of intelligence, more than half the students gained in decile rank in scholarship whereas in the upper deciles in intelligence, more than half lost in scholarship rank. The large number of students who are displaced by more than $\pm$ one decile in scholarship over their decile rank in intelligence is rather evenly divided between those who gain and

TABLE 1

Per Cent of Boys and of Girls in each Decile of Intelligence Whose Scholarship Decile was Displaced and Average Decile Change for each Decile of Intelligence

Decile rank in Intelligence	Per cent of boys who				Per cent of girls who				Average decile change	
	Gained in decile rank	Gained more than 1 decile	Lost in decile rank	Lost more than 1 decile	Gained in decile rank	Gained more than 1 decile	Lost in decile rank	Lost more than 1 decile	Boys	Girls
1 (high)	0	0	76	55	0	0	45	43	−2.4	−2.4
2	27	0	62	46	23	0	63	46	−1.9	−1.6
3	40	21	50	38	33	12	61	61	− .9	−2.0
4	40	26	44	35	32	23	48	36	− .5	−1.0
5	37	23	57	43	38	25	53	47	− .7	− .7
6	36	29	45	36	50	40	35	22	− .09	+ .7
7	43	34	49	29	72	40	20	8	+ .6	+1.5
8	62	50	31	15	39	50	28	17	+1.5	+1.8
9	71	55	11	0	63	54	26	0	+2.4	+2.2
10	69	58	0	0	77	60	0	0	+2.1	+2.3

This table is read as follows: Of the boys ranking in the highest decile in intelligence 76 per cent lost in decile rank in scholarship and 55 per cent lost more than 1 decile; of the girls ranking in the highest decile in intelligence 45 per cent lost in scholarship rank and 43 per cent more than 1 decile. The average decile change for the boys ranking in the highest decile in intelligence was a loss of 2.4 deciles; the same average decile change was found among the girls of the top decile in intelligence.

those who lose in decile rank. The table points out further that there is little difference between sexes in the proportions gaining and losing at each level of intelligence.

Since a large number of those ranking high in intelligence lost in scholarship rank it seems reasonable to assume that they have not put forth sufficient effort; perhaps they have had other interests, such as extra-curricular affairs. On the other hand, since many of those ranking low in intelligence raised their ranking in scholarship above their rank in intelligence, great effort must have been expended to accomplish this achievement. Have these students avoided other interests in order to concentrate upon their school work?

Participation in extra-curricular affairs was interpreted by means of so-called leadership scores obtained by crediting to each student a value assigned to each extra-curricular office held thruout the entire four years. The median of leadership scores was found for the girls and for the boys, each sex grouped separately, according to the number of deciles gained or lost in scholarship from the rank in intelligence. It was found that median leadership scores differed very little on this basis. The slight differences seemed to indicate, if anything, that students who gained in scholarship rank held more extra-curricular offices than did those who, by not participating intensively in such affairs, were able to devote more time to school work.

Of the girls who gained more than one decile in scholarship, presumably those who put forth great effort, 18 per cent had not held a single office. The average leadership score was 30.7 for this group of girls. By way of contrast, those girls who had lost more than one decile in scholarship, presumably those who did not attend to their studies industriously, averaged 20.8 in leadership while 29 per cent had held no offices. The same difference was found among the boys, as may be inferred from Table 2. Participation in extra-curricular affairs is apparently not the reason for a scholarship rank below what might be expected in consideration of the rank in intelligence.[1]

[1] The correlation between intelligence and leadership was .15 and between leadership and scholarship the correlation was .25.

TABLE 2

Median Leadership Scores of Boys and of Girls Grouped According to Change in Scholarship Rank from Rank in Intelligence

Change in scholarship rank from rank in intelligence	Median leadership scores	
	Boys	Girls
+9	.....	.....
+8	.....	40.0
+7	6.2	15.0
+6	25.0	25.0
+5	31.6	32.5
+4	30.0	23.3
+3	19.4	27.0
+2	11.0	20.0
+1	17.3	16.4
+0	12.7	17.5
−1	13.0	13.6
−2	9.8	19.1
−3	10.6	20.0
−4	9.1	10.0
−5	7.5	7.5
−6	10.0	6.2
−7	6.3	10.0
−8	.....	15.0
−9	5.0	5.0

This table is read as follows: The boys whose scholarship scores ranked in the same decile as their decile rank in intelligence, averaged 12.7 in leadership based upon participation in extra-curricular activities. Boys whose scholarship scores ranked one decile above their decile rank in intelligence averaged 17.3 in leadership; those who lost one decile averaged 13.0 in leadership. Same interpretation for the girl's average leadership scores.

What then is the explanation? Possibly it is simply that those who have the lower intelligence quotients felt it necessary to put forth strenuous effort to keep up in scholarship while those who rank high in intelligence had a superior feeling which made them think it unnecessary to study. Is the conclusion merely that intelligent students do not work hard on their studies while those of lower intelligence study very hard

to compensate for their poorer mental equipment? Possibly it is an unconscious effect of the standardization of our schools. Students of superior intelligence do not need to work hard because of the fact that schools do not offer them a challenge and they therefore slack to the extent that they do not accomplish the standard which could be reasonably expected of them.

Whatever the explanation, it is obvious from these findings that the often accused participation in extra-curricular activities is not usually an important contributing factor to the low scholarship of intelligent students.

A COMPARISON OF THE RATINGS OF MENTALLY RETARDED PRISONERS ON ARMY ALPHA AND STANFORD-BINET*

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IN testing the intelligence of large numbers of persons the common procedure is first to administer group examinations, and then to check up on the extreme scores by means of individual tests. It is generally assumed that high scores are not obtained by chance and are therefore valid indications of capacity, whereas low scores may be the result of a number of extraneous factors. The main difficulty with this procedure lies in determining the point at which the group test ceases to be reliable. This problem is discussed here with regard to one of the most widely used group intelligence tests, the Army Alpha.

The Army Alpha (Bregman revision) is used routinely in the psychological examination of prisoners in Illinois. Those who obtain scores below 25 on this test are then given the abbreviated Stanford-Binet. Since more than 1,200 prisoners received both examinations during the period 1930–36, it is possible to study the significance of low scores on the Alpha using the Stanford-Binet as a criterion.

Table I presented here summarizes the data obtained from the two types of examination and shows the average Stanford-Binet ratings of prisoners who made given scores on the Army Alpha. For example, the average Binet IQ of 58 prisoners who obtained Alpha scores of 24 was 74.7, with a standard deviation of 8.0. The last column of the table lists the Stanford-Binet IQ equivalents found for these same scores in war-

* Studies from the Division of the Criminologist, Paul L. Schroeder, Director, Chicago, Illinois. Series A, No. 100.

TABLE I

Average Stanford-Binet IQ's for Prisoners Scoring Below 25 on Army Alpha

Army Alpha score	Number of cases	Stanford-Binet IQ		U. S. Army IQ equivalents*
		Average IQ	Standard deviation	
24	58	74.7	8.0	75
23	51	74.5	7.2	74
22	64	73.2	7.0	74
21	57	73.5	8.2	73
20	59	73.9	6.4	73
19	62	71.0	7.7	72
18	53	73.8	8.8	72
17	48	74.5	7.6	71
16	49	70.5	7.1	70
15	50	71.4	6.9	69
14	47	71.7	7.3	69
13	51	71.7	10.5	68
12	41	70.7	8.0	67
11	52	70.1	7.2	67
10	52	70.6	8.0	66
9	49	68.3	7.8	65
8	60	69.5	7.8	64
7	38	69.3	6.8	63
6	51	69.9	8.7	62
5	41	68.3	8.3	61
4	50	69.6	8.4	60
3	54	68.4	11.2	58
2	41	68.5	7.9	57
1	56	69.0	11.1	54
0	43	67.3	10.9	50
Illiterate	166	68.1	11.0	—

Total — 1,443

* Memoirs, The National Academy of Sciences, Vol. XV, 1921, p. 195.

time testing, as interpolated from the Army Memoirs.[1] There is also included a group of 166 prisoners who received only the individual test. Most of these were, as listed in the bottom line of the table, illiterate; a few had poor vision, foreign language handicaps, or some other disability which prevented their taking a group test. The IQ as here used is computed upon

[1] Memoirs, The National Academy of Sciences, Vol. XV, 1921.

the basis of a 15-year level of mental maturity, since all of these cases are adults.

A study of the table discloses a number of interesting points. Most striking is the discrepancy between the U. S. Army IQ equivalents and the average IQ's found here, especially for Alpha scores below 16. The widely reproduced table of equivalent scores (Memoirs, p. 195) was based upon a special experimental group of 653 English-speaking white soldiers who received both Alpha and Stanford-Binet examinations. Of this group only a small proportion obtained Alpha scores below 16, or, for that matter, below 25. It is evident that the Army sampling of cases was inadequate, at least as a basis for deriving IQ equivalents at the lower intelligence levels.

It can also be noted that the range of intelligence covered by Alpha scores of zero to twenty-four is much narrower here than the range in the Army data. According to the Army norms a score of zero is equivalent to an IQ of 50, by extrapolation; this would indicate a range of 25 IQ points for the series of scores under consideration. In contrast to this, the range found here is only 7.4 points, *i.e.*, IQ 67.3 to 74.7, rather than IQ 50 to 75.

In view of this restricted intelligence range it follows that the separate Alpha scores from 1 to 25 are not reliably differentiated from each other. The average Binet ratings for Alpha scores of 20 or above are, however, significantly (critical ratios above 3.00 in terms of sigma) above the average ratings of the illiterate group and of the groups scoring zero to four. As indicated in the column of standard deviations the distribution of Binet IQ's for each Alpha score above three shows approximately the same variability, with the middle two-thirds of the cases falling within about 8 IQ points above and below the mean for each score.

The various group tests of intelligence differ widely in setting norms at their lower limits. For example, the norms for the National Intelligence Test begin with a raw score of 41 for which the equivalent mental age is 97 months; the Terman Group Test begins with a score of 1 as the norm for

90 months. In the Army Alpha, scores of one, two, and even higher are probably accidental, since those obtaining such scores are not reliably differentiated by the Stanford-Binet from those in the same population who did not take the group test at all (*i.e.*, the "illiterate" cases). Alpha scores up to 10 appear in general to be unreliable.

In prison work it is essential for purposes of classification and administration to differentiate the mental defectives from those of higher intelligence. Assuming, as many authorities do, that this arbitrary dividing point is at a Binet IQ of 70 (mental age 10–6), it may be concluded that the Alpha test does not measure mental defectives distinctly enough for reliable diagnosis. This conclusion is based on the fact that the mean IQ for all the low scores is close to 70, with a standard deviation which in all instances spreads above and below this point.

Nevertheless, the Army Alpha test is significant for indicating those who are probably *not* mental defectives. For example, 65 per cent of those who make scores of 16 to 24 are above 70 IQ on the Stanford-Binet. Of those making below 70 IQ on the individual test only 14 per cent are above the score of 20 on the Alpha; most of these 14 per cent are proximal cases, *i.e.*, in the 65–70 IQ range. It may be safely assumed that an individual scoring above 20 on the Alpha is not a mental defective.

The conclusion may be drawn, therefore, that a group test such as the Army Alpha is useful even for low-grade cases if the minimum literacy is present. Group intelligence tests provide another sampling of behavior under conditions widely different from those of the individual tests. It is quite likely that some mentally retarded persons work more effectively in the group test situation and may, in fact, obtain more valid ratings than on individual tests. Where there is a discrepancy between the Alpha score and an individual test rating, an evaluation must be made on the basis of an analysis of the two tests, consideration of the particular conditions of testing, and knowledge of the subject's background and personality.

PHRASING THE QUESTION IN CONSUMER RESEARCH*

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Psychological Corporation

THE questionnaire technique is of prime importance in social science, where many of the data are obtainable only in the reports given by individuals. Those in Psychology, Economics, Sociology, Government, Personnel, and Social Work who use questionnaires are discovering and investigating problems of technique related to their own methods and fields. Psychologists are especially interested in the form of the question and its effect upon the response.[1] In the field of consumer research results are also recognized to be a function of the form of the question. Investigators in this field[2,3] have pointed out the necessity for repeated trials of the questionnaire with varying forms of the questions before a study is finally made.

There is to date an absence of any summary of specific results on this problem of the form of the question in consumer research. An attempt, then, to verbalize and illustrate principles involved in the wording and planning of questions in the questionnaire is timely and necessary. Important considerations in the wording of the questions include such items as comprehension, anachronism, bias and prejudice, influence in

* The writers are indebted to the Psychological Corporation for permission to use those questions appearing on studies conducted by it, and for permission to use results gathered by it which are reported herein.

[1] *Cf.* B. Muscio, The influence of the form of a question, Brit. J. Psychol., 1916, 8, 351–389.

[2] E. Roper, Three weaknesses of market research, Market Research, 1938, 8, No. 6, 16–19.

[3] F. R. Coutant, Supervising the field investigation, Market Research, 1938, 8, No. 6, 19–21.

subsequent questions, etc. In this paper, nine principles will be discussed.

(1) *The introduction and the opening questions must create rapport.* One of the most difficult problems faced by the interviewer, particularly in large cities (where people are always being solicited for something) is to get the interviewee in such a frame of mind that he will answer questions. In a recent study of public opinion[4] the interviewers were instructed to begin, "We are making a little study of what people read and think about certain things. For example . . ." (the interviewer reads the first question immediately). This approach was found to give the interviewer a good start.

The introductory questions also have much influence in determining the success of the interview. Frequently the nature of the study is such that if the really important questions are asked before optimum cooperation is secured, the interviewee will abruptly terminate the interview. In a study on employees' attitudes and feelings toward their supervisors and fellow-employees, it was obviously necessary to get the interviewee to talk about subjects concerning which he is usually reticent. This could be achieved only by disguising the purpose of the interview. The first few nonspecific questions dealt with the government and its effect on business, employment, the interviewee's neighborhood, his friends, and finally, himself. From these questions it was comparatively easy to ask: *How regular has your work been in the past year? How long have you worked for your present employer? Do you intend to stay with him in the future?*

(2) *The questions must not be ambiguous.* The questionnaire must avoid mere empty words, and as Lazarsfeld states[5] the questions should be specifying. This, then, largely involves the technique of asking *why.* A question such as *Why did you change to this dentifrice?* will elicit some such re-

[4] Psychological Corporation, A study of public relations and social attitudes, J. Appl. Psychol., 1937, 21, 589–602.

[5] P. Lazarsfeld, The Technique of Marketing Research. New York: McGraw-Hill, 1937, pp. 62–91.

sponse as "I like it," a meaningless phrase. Other respondents may say, "My dentist recommended it to me," while still others report "It cleans teeth better than my former toothpaste." Obviously, then, the question must be rather specific in order to elicit comparable responses. Consider, for example, the following series of questions used by the Psychological Corporation in one of its studies:

> What brand of toothpaste did you buy last?
> How long have you been using this brand?
> What brand did you use before this?
> In what respects do you think your present dentifrice is better than the kind you were using?
> What was your principal objection to the brand you used before?

These questions elicited specific and meaningful reasons to explain behavior changes.

But difficulties in ambiguity may occur in other than the *why* questions. All questions used must be simple, brief and clear, with an obvious meaning. Often a slight change in the wording of a question will clarify an otherwise ambiguous question. In a recent study on newspapers and magazines, the person interviewed was asked what papers he saw occasionally. This was followed with: *Which of these do you like—that is, what features or items?* In many cases the question remained unanswered. Furthermore in many cases where it was answered, confusion resulted in attempting to relate the papers liked to the features or items mentioned. On the next trial of the questionnaire, the question was worded: *What features do you like or dislike about* (name each paper)? This question elicited complete answers referring specifically to each paper. In another study on the use of cameras and films, information was desired about the circumstances, occasion, and reason for the last use of the camera. This question was phrased in a preliminary interview: *What was the occasion or event which prompted these pictures?* Compare the lack of polish of this question with the more conversational tone of its revision: *How did you happen to take these pictures?* Those interviewed found it easier to answer this later form of the question.

(3) *Questions should be concrete, not abstract.* One should never ask a question of this type: *How often do you change your razor blades per month?*[6] This involves considerable computation on the part of the consumer who is interviewed. Instead, the individual should be asked: *How often do you change your razor blade?* This puts the individual into a situation which is common to him, and he will be able to answer the question more accurately.

The same point is illustrated by some questions in a recent study. It was desired to find out what the approximate annual consumption of beer was per individual. The question: *How much beer do you consume in a year?* would have been extremely difficult to answer because of the memory and computation involved, so two questions were asked: *How much beer did you buy on the last purchase?* and *When, how long ago, did you last buy beer?* By asking these questions at different seasons of the year, a true annual measure of consumption could be secured.

For some articles or commodities, however, making the question too concrete may lead to inaccuracies. For example, on a recent study of milk consumption habits, this question was asked: *About how many quarts of milk do you buy from the store each week?* In the case of a staple which is bought as frequently as milk, a weekly estimate can readily be given, and the use of the sort of questions listed above is not necessary. The accuracy of this particular estimate is further shown when it is observed that the projection of these consumption figures for Metropolitan New York, where the study was made, came remarkably close to the actual weekly consumption figure for milk in that area.

(4) *Wherever possible, the individual interviewed should be given a means of expression.* Frequently, one cannot ask too direct a question. The question must be so phrased that the interviewee can express himself. In a study of the milk drinking habits of adults, it was desired to know how people felt

[6] Example from W. J. Reilly. Marketing Investigations. New York: Ronald Press, 1929, p. 129.

about the food value of milk, but obviously a direct question of this sort could not be asked. The question used was as follows: *Which do you consider more nourishing—a bottle* (pint) *of milk, or one-half pound of beefsteak, a half pound of potatoes, two eggs, or two pounds of string beans?* Since all of these alternatives are approximately equal in their nutritive value, the individual chooses on the basis of belief rather than knowledge. Another example of helping the consumer to express himself is given by the many General Motors surveys.[7] In these alternatives, possibilities for the part of a car are presented, and the individual is asked to check the one he prefers. Or, if he wishes, he may add his own idea to the list. This makes the entire task much easier than if he had to draw exactly what he wanted; it verbalizes what would have become an artistic task.

(5) *The effect of context or the point of reference must be considered.* The part of the questionnaire in which the particular question is placed may have a decided effect upon the answers secured. In a study on alarm clocks, two questions were asked in this order: *What improvements do you think can be made in alarm clocks? How does the tick of a clock affect you at night?* If the *tick* question had been asked first, there would have been an undue number of answers to the *improvement* question which referred to the loud ticking of a clock.

The setting or context of a question may actually act as a point of reference for the individual to consider when making his answers. In a study of the use of beer, three specific questions about use were asked in the first part of the questionnaire, and to these questions, largely names of local beers were given. The fourth question read: *What brand of beer do you consider to be best?* Later on during the interview, after the interviewee's thinking had been turned in somewhat broader channels, the question was asked: *What do you consider the very best brand of beer in this country?* To the former question

[7] See the booklet, Customer Research, published by General Motors Corp., pp. 46.

largely names of local beers were given; to the latter names of more nationally-known brands were secured. One nationally-known beer was given in only 9.5 per cent of the cases when the former question was used, but rose to 14.9 per cent of the responses when the broader question was used, a reliable difference in terms of its standard error.[8] A local brand dropped from 5.0 per cent for the first question to 3.5 per cent for the latter, the chances being 8 to 1 that this is a real difference. The frame of reference, then, is quite important both in terms of phrasing a question and locating it in the questionnaire.

(6) *The form of the question must be related to the background of the person interviewed.* The interviewee's pride, beliefs, and his entire background must be taken into consideration in the wording of questions. Members of the lowest economic group, for example, would not be asked whether they read one of the more expensive magazines, such as Fortune.

The pride of the individual was found to be an important factor in a study of newspaper readership made in New York City. The question was asked: *What newspapers do you read most regularly?* Answers secured here were almost all the New York Times and Herald Tribune; no one admitted reading the Daily News or Mirror; very few the Journal or American; and only a few more the World Telegram and Post. Apparently the person interviewed was ashamed to admit which paper he read, unless it was a socially acceptable publication. In a revision of the interview form these questions were asked: *Who are your favorite reporters and columnists in the papers you read regularly? Who are your favorite sports writers in the papers you read regularly? What are your favorite comic strips in the papers you read regularly?* From these questions a more accurate account of newspaper readership was obtained. Thus an indirect approach may frequently be necessary to adjust to the ego of the person being interviewed. Another example of how the influence of pride may

[8] Based upon the ratio of the difference to the standard error of the difference, a ratio of 3 and more interpreted as indicating reliability of difference.

operate in the answering of questions is supplied by White.[9] He observed that many of the people in the higher economic groups would not admit reading certain types of magazines. White therefore had his interviewers call on these homes to solicit magazines for the use of a charitable organization; when this method was used the readership of certain types of magazines was found to exceed by 50 per cent the number of respondents reporting them in the direct interview.

Personal questions, as already seen, must be carefully placed in the body of the questionnaire. Questions reflecting upon the intelligence of the person being interviewed must also be carefully located and phrased. For example, many interviewees are unable to answer questions concerning advertising themes and slogans. If one is forced to answer "don't know" to too many questions, he usually resorts to one of two escapes. Either he ends the interview, or he makes up answers to cover his ignorance. In a study on remedies for the common cold, the following question was asked with respect to six remedies: *What cold remedy have you seen or heard advertising:*

(1) *Actually kills a cold in a day?*
(2) *Sells over 53 million packages a year?*
Etc.

To insure the success of the other parts of the interview, such questions should be left for the end, otherwise too many "don't know" answers in the early part of the interview will cause the respondent to find "a way out." The questions, then, must not damage the pride of the interviewee, or make him feel at all embarrassed.

An appeal to the individual's own judgment or beliefs will change the response secured. Consider the following questions asked in a public opinion study: *Are you willing to have an increase in prices with the hope that it will bring back prosperity?* The percentage of affirmative answers was 69.6 per cent. When, however, the question was worded: *Are you willing to have a reasonable increase in prices with the hope that it*

[9] P. White. Market Analysis. New York: McGraw-Hill, 1921.

will bring back prosperity? the proportion of "yes" answers had increased to 81.0 per cent. In the first case there was no appeal to the judgment of the person interviewed, merely an increase in prices was suggested. In the second case, however, the person was allowed to make his own judgment as to what *reasonable* meant; he then answered the question in line with his definition. This change in question form resulted in a reliable difference in the proportion of "yes" answers, the ratio of the difference being greater than three times its standard error.

The questions must be related to the situation of the respondent. In a recent study of the attitude of a group of relief workers toward work relief, two questions used in the original form of the questionnaire were: *Do you have any objections to the present work relief set-up? What improvements would you like to see made in the present work relief set-up?* An analysis of the data indicated that the objections were the very same things in which improvements were desired. However, only 50 per cent answered the first question by giving objections, whereas 74 per cent answered the second question by listing improvements. This would indicate that 24 per cent were dissatisfied with certain aspects of work relief, but did not care to or dare to express any objections. When asked for suggestions for improvements they spontaneously revealed their dissatisfaction with some elements in the situation.

(7) *The effect of extreme alternatives must be realized.* The question must be so worded that the possibilities of answer are not restricted to extreme viewpoints. As an example of the effect of a harsh alternative, consider the results of two questions used by Houser.[10] *Is the service at Blank's reasonably good? Is the service at Blank's all you would expect?* The former question, which allowed plenty of leeway for opinions on either side of a neutral answer to the question, secured a 60 per cent "yes" response. However, in the second phrasing

[10] J. D. Houser, Measurement of the vital products of business, J. Marketing, 1938, 2, 181–189.

those who reply "yes" mean that the service at Blank's is nearly as perfect as possible; therefore there is little room allowed for a more favorable attitude toward Blank's while there is too great a range allowed for attitudes less favorable. As might be expected, only 20 per cent of the answers to this question were "yes."

(8) *Questions must be non-emotional and unbiased.* It should scarcely be necessary to warn that the question in the market study must be unbiased. Naturally, if one asks: *Should "reds" and "radicals" in this country be deported?* he would expect a higher proportion of affirmative answers than if he asked: *Should members of the American Communist Party be deported?* The question must be as unbiased and unprejudiced as possible in order to secure an accurate measure of the public opinion. In a recent study sponsored by a broadcasting company, it was realized that possible bias might distort results on dealer preferences as to advertising media. In order to be sure that the wording of the questionnaire gave no hint as to its sponsor, the questionnaire was shown to dealers who were asked to tell which advertising medium, in their opinion, was sponsoring the study. The number of those responding "radio" was no greater than one would expect from chance alone.

(9) *The influence of the check-list must be considered.* Jenkins[11] describes a clever experiment in which he asked 200 members of a class to list what they regarded as the outstanding advantages or disadvantages of fraternity life as they had encountered it. The results were tabulated, and a check-list made of the various responses. No difference in the frequency of responses was observed when this complete check-list was submitted to a group of the same size and nature of the original class. Jenkins then eliminated the five previously most frequent answers from the check-list, and supplied a blank for additional answers. When the original group filled in the

[11] J. G. Jenkins. Psychology in Business and Industry. New York: John Wiley & Sons, 1935.

blanks, the five answers were completely displaced in terms of frequency.

Apparently, then, until further research has been performed, we shall have to be very careful in the use of the check-list in commercial studies. As a further indication of this, the J. Walter Thompson Company used two sets of questionnaires which were answered by the same group of people at an interval of two weeks.[12] The first questionnaire inquired about the magazines bought or subscribed to for home use, and a list of 27 magazines was provided for the interviewer to read and check as the respondent gave his answers. The question was worded in the same way in the second questionnaire, but there was no check-list; free response was secured. The responses to magazines readership varied considerably, indicating that the check-list stimulated the respondents to report more magazines read.

The check-list seems to have one very definite advantage over the free response, in that if so desired, it can eliminate what Lazarsfeld calls the "tacit presupposition."[13] He shows that in answering questions, we assume certain limitive requirements. When school children were asked what they most desired in life, the most common answers were income, reputation. . . . When they were given a check-list containing "great intelligence" as one of the alternatives, all checked it, though none had given it in free response, their tacit presupposition being that one could not acquire great intelligence, that one simply had it or lacked it, so there was little point in listing it as something desired.

If the check-list is exhaustive there is little danger of bias, but if certain possible alternatives have been omitted, the answer will be greatly affected by it. The usefulness of the check-list depends upon the validity of the items, their completeness, and their order, and these can be developed properly

[12] Described in A. T. Poffenberger. Psychology in Advertising. New York: McGraw-Hill, 1932.

[13] Described in Jenkins, *op. cit.*

only through making trial interviews with free response questions.

We can see from all of the preceding illustrations that the form and position of the question are of extreme importance in the consumer questionnaire. This paper is not by any means a suggestion that all of the answers to these problems are known; most of the variables have only recently been recognized as important in the consumer interview. The writers hope, however, that by summarizing this material, further research will be encouraged. The influence of the question form upon the results secured can scarcely be over-estimated.

THE ADJUSTED GRAPHIC ANALYSIS CHART

R. E. DUNFORD

Professor of Psychology, University of Tennessee

EVALUATING THE APPLICANT

ONE of the most important functions of any personnel organization is the efficient and accurate evaluation of those who apply for employment. The selection of the best available candidates for positions and their proper placement is the first step toward the solution of the many problems confronting a personnel officer.

It is our purpose here to present a new tool, a new technique which gives some promise of placing the evaluation of the applicant on a more scientific and satisfactory basis. The use of this technique is intended to objectify and render more accurate the means now used in arriving at a final judgment on the qualifications of those who apply for positions.

As now designed, and as it will be discussed, the technique of selection proposed is meant to be applied to annual employees rather than to those on hourly wage. Thus in the public service it is intended to supplement and coordinate other selective measures applied to those in the classified service at professional and sub-professional grades. There is no apparent reason, however, why this technique or some modification of it might not be applied widely in those industries where it is necessary to select yearly rather large numbers of employees from available applicants. As a result of the work of those interested in this problem of better evaluation of applicants a number of tools and techniques have been applied to the problem. The use and refinement of these methods by personnel men in practical situations is the final proving ground of their

utility. Some of the tools which to a greater or lesser degree have proven their worth in the selection of employees are as follows:

1. *Job Analysis.* Obviously a full knowledge of the requirements of the job or position is essential to the selection of the applicant best qualified to fill the position in question.

2. *Tests.* Wherever it has been demonstrated that test scores and occupational proficiency are highly correlated they are being and should be used. Unfortunately tests are rarely used successfully. When they are used they should be considered but one of the indicators for selection.

3. *Application Blank Analysis.* The evaluation of eligible employees by careful analysis and scoring of application blanks is a valuable tool. To a skilled examiner the application blank reveals much that is not seen by the ordinary observer.

4. *Reference Letters.* Properly framed inquiries form an invaluable source of information regarding the applicant. The evaluation of the information so obtained must be skilled, to be of use. The content of letters of reference must be interpreted in relationship to their source and to all other information on the applicant.

5. *The Interview.* The planned employment interview directed toward obtaining deciding information on the qualifications of the applicant is the final stage in any well programmed placement operation. Here the personnel man has an opportunity to exercise his considered judgment in a critical evaluation of the applicant's personality, characteristics and other subjective factors which often make for success or failure.

6. *Special Qualifications.* Special qualifications, such as medical certification, age, sex, etc., are frequently used.

To these commonly used methods of evaluating the capabilities of applicants I would add another, *The Adjusted Graphic Analysis Scale.* This scale or chart is not meant to replace, but to supplement and coordinate the methods just discussed. The chart was evolved during a period of research study with the T. V. A. I hereby acknowledge the aid and cooperation I

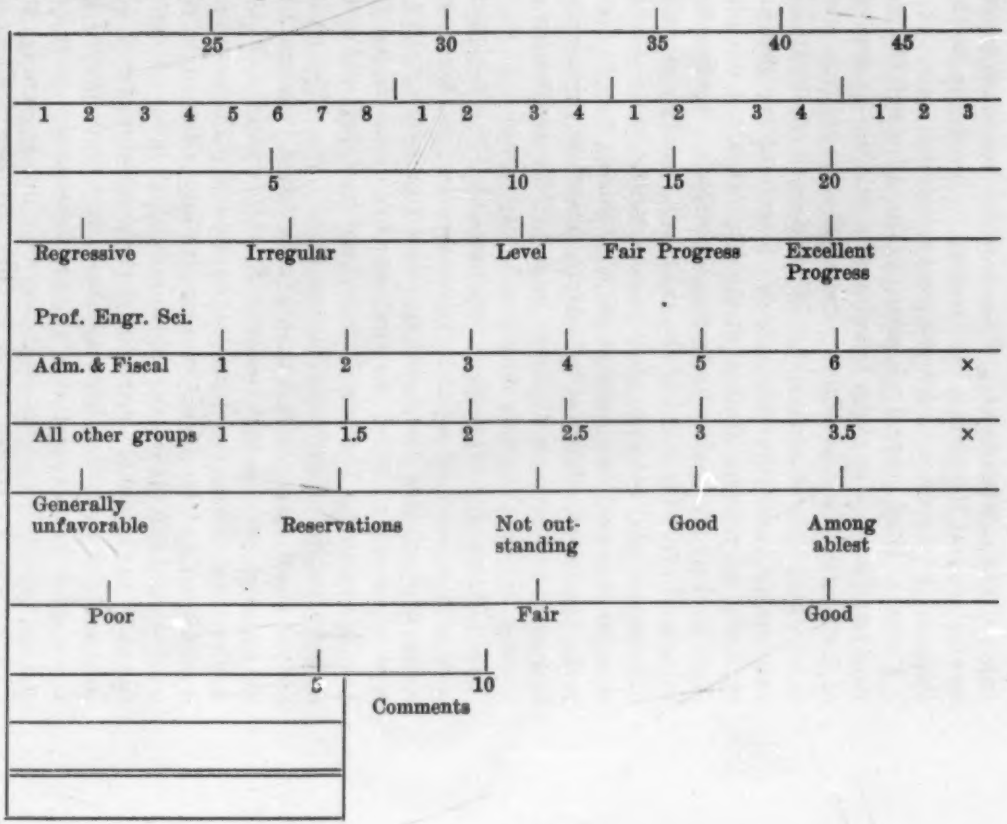
ADJUSTED GRAPHIC ANALYSIS CHART

ADJUSTED GRAPHIC ANALYSIS CHART
(For Professional and Sub-professional Groups)

Name .....

Position analysis made for

Give position and grades on each Civil Service qualification



GRAPHIC ANALYSIS CHART

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received in its development. The chart has had some experimental use and the results have seemed to justify its further trial and development under practical conditions.

Purpose. The general purpose of the Adjusted Graphic Analysis Chart is to assist examiners in making an analysis of the applicant's capabilities. Essentially the analysis chart is constructed to separate out diagnostic signs of ability and potentiality and to provide a profile picture of the elements pertinent to probable success on the job. It is not intended that the chart mechanize the process of analysis. Its function is rather to free the mind of the examiner from the necessity of retention of diverse objective facts regarding the applicant in order that greater concentration of attention may be given to the exercise of subjective judgment. The form furthermore is designed to give an objective basis for the assignment of Class A or B to the grade indicated by experience.

The Theory and Method of Development. The form consists of a number of separate items arranged on horizontal scales, with suitable descriptive captions, for checking the degree or amount to which the applicant has demonstrated the item in question. The items selected are those believed to be most indicative of probable success on the job. The entire scale is based upon the fact that what is called "Success" in the business world is best measured by the formula A/T; *i.e.*, Achievement/Time. In this same practical world achievement is measured by the degree of responsibility attached to the position held and the salary commanded, which in turn is determined by the profitable character of the services rendered. It is recognized that the above assertions can be disproved by many specific cases, and that abnormal economic conditions destroy their validity. Nevertheless they do characterize the mean prevailing tendencies in a relatively free competitive system.

In the Graphic Analysis Form, Age or Time is then the denominator by which achievement and potentiality of achievement are measured. Thus if a man of thirty, in a given field

of work, has attained the amount of success ordinarily achieved by men in similar work we say he is "fairly successful." If he has made a spectacular rise we say he is "very successful, etc." If his progress has been negligible it may be that he has yet to find his place and it may be that he will never find it.

It is questionable whether an Employment Service can operate as a "Vocational Guidance Bureau." The task of an Employment Service is one of selection of the right man for the job, rather than guidance of misfits and unfits. For this and other reasons the "Analysis Chart" places heavy emphasis upon experience, progress and salaries previously obtained. Education is included since it is akin to experience and indicates potentiality. Significant references illuminate experience records and furnish a basis for prediction of the applicant's utility and ability to "fit-in" with the organization. The Analysis Chart is so arranged that a normal and average development in a given field of work will show a parallel progress in age, experience and salary. Unusual progress will be shown by a salary and progressiveness in advance of the applicant's age.

Use of the Chart. The use of the chart will be clear from its examination. Space is provided for the name of the applicant and the position for which he is being considered. C. S. refers to Civil Service rating. *Age* is checked by placing a dot or small circle along the line at the appropriate place. *Education* is checked in accordance with number of years completed. Thus college graduation should be checked at 4. Degrees, where obtained, and year may be written in at the extreme right of the blank. *Experience* is likewise checked in number of years, counting only the experience in the field applied for or closely related fields. Here the examiner must exercise his judgment on the matter of transfer value of one type of experience to another field. The *progressive character of experience* is checked along the horizontal line, using the descriptive words as guides only. The check or circle may be placed anywhere along the line best indicating the degree of progress.

The highest salary, for one year or more, should be checked on one of the two scales provided. For the sake of simplicity the two scales were arbitrarily established at mean figures, and coded after the "Occupational Index." The numbers refer to thousands of dollars. Thus if an engineer's salary is stated at $4,000, an equivalent teacher's salary would be $2,500. Refinements in checking salary are desirable since recognized differences in salary scales exist dependent upon locale, economic conditions, and many other factors. Here again the exercise of judgment based upon knowledge will enhance the utility value of the chart. (When the lower scale is used the point should be checked on the upper salary line.)

Significant References are those that furnish valid estimates of the applicant's worth. They come from *recent employers qualified to judge* the applicant's ability to perform the work under consideration. They should emanate *from immediate,* not indirect knowledge of the applicant's proficiency for *a period of one year or more.* Here again the check need not be placed directly above a descriptive word, but rather where best judgment dictates.

General References come from friends, acquaintances, bankers, and those who have no direct knowledge of the applicant's proficiency in the performance of the work in question. Such references perhaps give some information of value but are to be regarded as confirming addenda rather than determining indicators. *Experience in other fields* provides an opportunity to check years in activities foreign to the field of application. The history of these activities may be briefed in the space at the right.

Space is provided for the examiner's final analysis as to Grade and Class together with space for comments.

Interpretation of the Profile. When completed the examiner will have checked each item indicating the degree to which the applicant has demonstrated this item. If these points are then connected, what might be called a profile of the applicant will be obtained. *Do not include General References or expe-*

rience in other fields when connecting points. This profile will be ordinarily very irregular. If the examiner will draw a line down the page, midway between the points checked, smoothing by inspection, a curve will be obtained. This curve, or line, will offer a seemingly objective index of the potential and actual value of the applicant in question.

Generally speaking, the following characteristic curves will be obtained:

1. *Vertical Line.* Such a line indicates regularity of progress and average or slightly better than average ability. In the older ages such a line indicates high technical proficiency and ability to perform the job applied for. Such men will command rather high market price.

2. *Line Slanting Toward the Right at Bottom.* A curve or line of this character indicates superior ability, experience and progress. The greater the inclination of the line the more likely the prospect.

3. *Line Slanting Toward the Left at Bottom.* Such lines indicate a regressive or at best level type of experience record and relatively inferior progress.

4. *Parabolic Lines.* Such lines indicate an educational background and a potentiality for achievement. In this type of curve experience is lacking, either because the individual is recently out of school or opportunities have been lacking for regular employment. The references and the scholastic record are the useful signs. Such applicants cannot be selected with the certainty possible in dealing with experienced men.

One value of the Graphic Analysis Chart lies in the fact that several applicants for the same position can be plotted on the same chart. This permits a direct and objective comparison of their profile picture. The analysis of the separate factors together with the synthesis accomplished by connecting the points to form the profile, serves to crystallize and clarify the subjective judgments of the desirability of applicants.

NEWS AND NOTES

The American Association for the Advancement of Science will meet in Columbus, Ohio, December 27, 1939, to January 2, 1940, under the direction of the following officers: President, W. B. Cannon, Harvard Medical School, Boston, Mass.; General Secretary, Otis W. Caldwell, Boyce Thompson Institute of Plant Research, Yonkers, N. Y.; Permanent Secretary, F. R. Moulton, Smithsonian Institution Building, Washington, D. C.; and Executive Assistant, Mr. Sam Woodley, Smithsonian Building, Washington, D. C. Dr. Wesley C. Mitchell, Columbia University, is the retiring President. The chairman of the Advisory Committee of the Ohio Academy of Science is Dr. Alpheus W. Smith, present chairman of the Department of Physics at Ohio State University.

Section I (Psychology) of the A.A.A.S. will meet from Wednesday to Friday, December 27 to December 29. Besides programs of special papers, there will be a symposium on Thursday morning, December 28, on "The Internal Environment and Behavior," under the chairmanship of Dr. Ross A. McFarland of Harvard University. There will also be a joint session with Section Q (Education) and a joint dinner with the same section at which time Dr. J. F. Dashiell of the University of North Carolina will deliver one of the addresses.

All members and Fellows of the Section are invited to send abstracts in duplicate (not more than 300 words in length) of papers which they wish to present. Please note that no paper can be allowed more than 15 minutes' time on the program.

Abstracts should be sent to the Section Secretary, Leonard Carmichael, Tufts College, Medford, Mass., not later than November 4, 1939.

Dr. Ralph B. Kenney, formerly vocational counselor in the public schools of Albany, New York, has been appointed Executive Secretary of the National Vocational Guidance Association. Dr. Kenney will also serve as Managing Editor of *Occupations, the Vocational Guidance Magazine*, the official publication of the Association. The headquarters of the Association have recently been moved to 425 West 123rd Street, New York City.

The founding half a century ago at Indiana University of a psychological laboratory by William Lowe Bryan, then the University's young professor of philosophy and now its president emeritus, was commemorated Oct. 21 by "The Bryan Symposium in Psychology."

Invitations to join in the commemoration, which was featured by addresses by Dr. Bryan and eminent American authorities in psychology, were extended to the psychology departments of the country's colleges and universities, to psychologists of the Middle West, and to graduates of the University's psychology and philosophy departments.

Plans for the observance were worked out by Dr. Winthrop N. Kellogg, professor of psychology; Dr. Chauncey M. Louttit, associate professor of clinical psychology, and Edgar L. Yeager, assistant professor of psychology, and a graduate student committee composed of Richard S. Ball, Buffalo, N. Y.; Irvin Wolf, Wabash, and Robert S. Daniel, Brazil. Dr. Edmund S. Conklin, head of the University's psychology department, was in general charge of the arrangements.

The program for the symposium consisted of morning and afternoon sessions, a luncheon at which Dr. William F. Book, head of the psychology department from 1917 to 1934, was the speaker, tours of the psychology laboratories, and a dinner meeting with Dr. Bryan as the speaker.

The Indiana University psychological laboratory, started with the buying by Dr. Bryan of the first piece of apparatus, a chronoscope, which still is in use, is the fourth oldest in the United States, having been preceded in its founding only by laboratories at Harvard, Johns Hopkins and Pennsylvania. Dr. Bryan read one of the two papers at the first meeting of the American Psychological Association, organized three years after the establishment of the Indiana University laboratory, and in 1903 served as president of the Association, one of the few university presidents ever to be accorded that honor.

Dr. W. Carson Ryan, staff associate of the Carnegie Foundation for the Advancement of Teaching, in Bulletin Thirty entitled *Studies in Early Graduate Education*, reviews the chief factors in the successes of Johns Hopkins University, Clark University and the University of Chicago in their early days to learn to what extent American universities of today can learn from them. The unusual achievement of the early days at these universities, established in 1876, 1888, and 1893 respectively, he found came primarily because those in charge recognized the urgency of certain contemporary needs that were not being met by the conventional college education of the day; because, moreover, in striving to meet these needs those in authority had the wisdom to place the human element in the educational process—the students and faculty—ahead of buildings, enrolments, administration, and organization; and because the men who headed the universities were themselves vigorous personalities who insisted upon the highest possible quality of intellect and character in the institutions they directed. All three of the universities began with the very definite conviction that fundamental changes were necessary. "A new institution on a new plan" was President Gilman's intention at Baltimore. Presi-

dent Hall consented to go to Worcester only on the assurance that he was not to head a conventional New England college, but rather to establish a new kind of university that would break with the traditional type of higher institution in America. At Chicago, President Harper sought to build a university that would provide a "center of thought on every problem connected with human life and work."

Especially with respect to what all three universities called "research" there seems to have been a much more specific sense of responsibility for human welfare and the needs of society than came to be associated with research activities at a later period.

The principle that universities are made possible by men rather than buildings was insisted upon in all three of these institutions in their early days. This concern for careful selection of faculty and students was accompanied in all three institutions by an insistence upon conditions of teaching and learning that encouraged independent investigation, intimate and informal teacher-student relationship, and a minimum of administrative machinery. Freedom of teaching and learning was inherent in these pioneer beginnings at Hopkins, Clark and Chicago. The principle of "complete freedom of speech on all subjects" was insisted upon from the first.

In his preface to the Bulletin, Dr. Walter A. Jessup, president of the Foundation, states that graduate education today faces significant difficulties. It may be that the changes since the earlier days are such that the methods of these pioneering institutions no longer apply. However, he adds, that "if the experience of what seems to us like simpler days can in the slightest degree help us to find our way in the present situation we should take advantage of it. We may even find that some of our complexities are unnecessary and that a measure of simplification is possible."

The Psychological Cinema Register, edited by Dr. Adelbert Ford, Lehigh University, is organized for the purpose of publishing and distributing research and teaching films for the field of psychology. Contributions will be received from psychologists whose position is such that their reports would ordinarily be acceptable to the editors of scientific journals. Film contributions are especially valuable when supported by published research. All contributions must exhibit good photography, adequate titling, and a high quality of experimental control.

The Psychological Cinema Register is prepared to reproduce motion picture films in 16 mm. or 35 mm. widths, from negative or positive masters, sound or silent types. Because the production of original films is an expensive activity for an author, the Register will pay each author a ten per cent royalty from the retail sale of each copy of a film. Those interested in availing themselves of the services of the Psychological Cinema

Register should communicate with Dr. Adelbert Ford, Packer Hall, Lehigh University, Bethlehem, Pa.

The World Book Company announces the publication of a new edition of the Iowa Silent Reading Test: the elementary forms Am and Bm for grades 4 to 9; and the advanced forms AM and Bm for high schools and colleges. The authors of these new editions are H. A. Greene, University of Iowa; A. N. Jorgensen, University of Connecticut; and V. H. Kelley, of the University of Arizona. As these tests now stand, every item contributes toward the correct evaluation of the pupil's silent reading ability of the work-study type. The norms accompanying the new edition are based on the experimental testing of more than 30,000 students. Scores are readily interpreted so that they can be effectively utilized for instructional, supervisory, and administrative purposes.

In the September, 1939, *Music Educators Journal* appears the twenty-first report from the Iowa laboratory studio by Dr. Carl E. Seashore. This report contains a review of the recent revision of the Seashore Measures of Musical Talent, the first revision made since they were designed twenty-five years ago. During this period a great deal of experimental work has been done both in this country and abroad. The revision, therefore, aims to bring experimental procedures in the laboratory up to date, both for the purpose of determining the wisdom in the choice of talents to be measured and refinement in the technique of measurement. Musicians and scientists who have employed these measures will be interested in knowing the main features of the revision.

1. *Improved recording*, by the most recently available technique in the RCA Victor recording studios.

2. *The stimuli.* It is comparatively easy now to produce tones of specified quality and control the measurements of pitch, intensity, time and timbre with precision with the now available tone generators on the vacuum tube principle.

3. *Elimination of the human element.* Formerly all stimuli had to be controlled by the human hand; in the present revision, all the four factors which can enter into recording have been controlled mechanically.

4. *Three test series.* Series A, for an unselected group, such as the school room; Series B, for a musical group; Series C, for the most refined measurement in individual testing.

5. *Increase in reliability*, due to the progressive restriction of the test stimuli to a probable threshold.

6. A complete *item analysis* was made with the preliminary recordings which, in general, are arranged in the order of difficulty.

7. *The records.* There are six measures, each of which is recorded on one side of a twelve-inch record.

8. *Shortening the test.* The shortening of the records is accomplished by placing all the test material for each measure on one side instead of on both sides of the record as in the original.

9. *Choice of measures.* Five of the original measures have been continued. A measure of timbre has been substituted for consonance because it has many elements in common with consonance and has the advantage of being highly adaptable for test purposes.

10. *Significant changes in each measure.* For pitch, pure tones having a frequency of 500 are used. For intensity, pure tones in decibel steps are used. For time, duration of the pure tone is substituted for the original time intervals between clicks. In timbre, the harmonic structure of the tone is changed in a complex tone having the same amount of energy in each of the first six partials. The change in timbre is produced by shifting energy from the third partial to the fourth. In tonal memory, the minimum interval of the changed note is a whole tone step instead of a semi-tone. In rhythm, a short tonal impulse is substituted for a click, and the rhythmic patterns are graded in the order of difficulty.

11. *Quantitative and specific.* Each measure represents a single and isolated factor and results are expressed in exactly defined quantitative terms. For pitch, it is frequency; for intensity, the decibel; for time, the one-hundredth of a second; and for timbre, the decibel change in energy of two partials.

The revision is the joint undertaking of Dr. Seashore, Dr. Don Lewis and Dr. Joseph Saetveit, all of the Iowa Laboratory. The revised measures have been made the property of the psychological laboratory of the University of Iowa with the provision that all earnings from sales shall be used for further experimentation in the area of musical talent.

Since three times as many who have indicated they expect to attend the Thanksgiving convention of the American Association for Applied Psychology come from states which will celebrate the holiday on November 23 as from states which will adhere to the November 30 date, the meeting has definitely been set for the 24th to 26th of November, at the Wardman Park Hotel, in Washington, D. C. The Executive Secretary, H. B. English, has informed those who had sent in reservations.

BOOK REVIEWS

JOSHUA ROSETT. *The Mechanism of Thought, Imagery, and Hallucination.* Columbia Univ. Press, 1939, pp. 271 + 18. $3.00.

This book consists of two parts, (1) the fundamentals and (2) the mechanism. In discussing the fundamentals the author is chiefly concerned with the physiology and neurology of emotions and "the expression and subjective experience of emotions." Here he cites the familiar experiments of Sherrington, Cannon, Bard, Barenne, Head and Holmes. His treatment of the subject is confusing by reason of his shifting suddenly from descriptions of phenomena to descriptions of physiological events. A statement which exemplifies this is the following: "That activity of the cerebral cortex which consists in the subjective experience of the sensation . . . is therefore significant of relatively exact orientation in the present and in the past; . . ."

While the subject matter of the first part of the book is familiar in a general way to most psychologists and may contribute little that is new to the physiologist, the detailed information contained will probably be of great value to one making a thorough study of physiological fundamentals.

The second part of the book which is concerned with psychological phenomena will be of interest to students of both normal and abnormal psychology. It includes discussions of attention, hallucination, epilepsy and sleep.

In the dicussion of attention, motivation is considered to be the determining factor, which contrasts somewhat with the fact that the chapter is begun with Wundt's definition of attention as *clearness of sensation.* Wundt has been understood as dealing only with experience while motivation has been taken as a physiological event. In general the author's conclusions about the state of attention seem to be speculative and not demonstrated.

Experience is described as consisting of sensory activity simultaneously with imagery and this would remind most psychologists of E. B. Titchener's context theory of perception, but there is no reference made to the latter.

When the author deals with the topic of sleep he seems to be saying that thoughts are rather complex patterns of images with relatively little sensory activity and therefore a "disorientation in the present" with "an orientation in the past." But then he gives the following example:

"A number of years ago while driving an automobile, by dint of considerable effort I barely managed to escape what might have been a serious accident. I thought no more about it the rest of the day. On going to bed, however, thoughts of *what might have happened* were so alarming that notwithstanding my fatigue I preferred to get out of bed and pace the floor for a time." This scarcely illustrates his point, for he admits being aware of his fatigue (present sensations) as well as appreciating that there was space beside the bed through which to pace, etc.

In many ways this is a thought-provoking book. There is a good discussion of what probably happens in epilepsy and in sleep. It gives a very clear and complete exposition of the functions of the autonomic nervous system in producing emotional responses and the relation of the autonomic to the central nervous system. An extremely valuable technique is used in following a complete explanation in each chapter with a summary of the important points. There are many "homey" illustrations, but in some cases so many examples to show a sub-point that the main thread of the discussion is hard to find again.

The book would have been improved if the references were more up-to-date. The vocabulary used makes the book a difficult one for psychologists to read, but is undoubtedly clear to physiologists.

K. W. Oberlin,
University of Delaware

Henry A. Murray and twenty-seven collaborators. *Explorations in Personality.* New York, Oxford University Press, 1938, xiv + 761 pp. $8.50.

Perhaps the most important problems of modern psychology are those directed at the delineation of the nature and characteristics of human personality. The American approach to this task has been to measure fairly large groups (usually of college students) and then to extract personality from the statistics obtained. In contrast European, and especially Germanic, investigators have studied limited and frequently selected groups and then intuitively created personality types (Jung, Kretschmer) or a blueprint of personality (Freud). Both approaches have made valuable additions to our knowledge of personality. Attempts to utilize something from both approaches have not been entirely lacking, but in the present volume Dr. Murray has reported the most elaborate attempt to study personality in which many methods have been tried and either rejected or made an integral part of a total research program.

Fifty-one men of college age were studied by Dr. Murray and his 27 collaborators for varying periods during the two and a half years of the research. Two groups of about 12 each were studied for short periods of two and three weeks. These served in the formulation of methods

which were finally used in studying two more groups over periods of two and six months. All of the subjects, except those in the first group, were college men. All subjects were paid at current rates for their time. The subjects were secured through the Harvard Employment Office, and were interviewed by Dr. Murray who explained the work to them. The research procedures began with a 45-minute interview of the subject by a Diagnostic Council of five (who, incidentally, are never identified); the subject then wrote an autobiography following a prescribed outline; and then submitted himself to some 25 interviews, tests, and measurements at the hands of as many investigators. This general procedure is described as "numerous sessions, of which as many as possible are controlled experiments, conducted by different examiners who work independently until at a final session they meet to exchange their findings and interpretations" (p. 705). It is impossible here even to enumerate the variety of specific methods used, each of which is described *in extenso* in Chapter VI. The general basis for the detailed experiments may be stated in the author's own words: "It has seemed to us that more progress could be made by conscientious clinical researches and by seeking experimental evidence for the validity of certain general intuitions about human nature than by devising tests to measure with precision things that have no influence on the course of life" (p. xii), and "We tried to design methods appropriate to the variables which we wished to measure; in case of doubt choosing those that crudely revealed significant things rather than those that precisely revealed insignificant things" (p. 26). To the reviewer this appears as a very wholesome attitude toward the study of personality.

In spite of the apparent open-mindedness shown in the preceding quotations, and by the author's consistent denials of finality, the most serious criticism of the whole work is a very real bias. The nature of this bias is shown in two quotations: ". . . since four of us have been practising Freudian psychoanalysis, the group as a whole were partial to and better acquainted with the theories of this school" (p. 722), and ". . . although we find something to criticize in psychoanalysis, we are not unmindful of the fact that from the start it has been our most constant guide and source of illumination. Without it these studies would never have been planned or finished" (p. 33). While there are occasional criticisms of a minor nature of psychoanalysis they do not affect the essential influence that these doctrines have had on the investigation. This is evident in the techniques used in securing and interpreting information concerning infancy and childhood; in the use of the Id-Ego-Superego concept; in the claim that certain needs are innate, in fact racial in the Jungian sense; in the extreme, almost exclusively, importance placed upon inner drives as final determiners of actions; and many more. Lip service is paid to the importance of biological and environmental factors in behavior, but the failure to investigate these is explained on the ground that the Harvard

Psychological Clinic had neither medical nor sociological services. Inasmuch as a physician and a sociologist might easily have been substituted for two members of the experimental group, one can only feel that the author's theoretical presuppositions did not require these contributors.

In many ways the discussion is inconsistent. For example, it is stated that "the organism and its milieu must be considered together, a single creature-environment interaction being a convenient short unit for psychology" (p. 40). This is, of course, the very basis upon which Kantor has developed his thoroughly objective system. The present author, however, makes such a statement and then neglects all but the inner drives. The locus assigned for the drives or needs (of which there is a catalogue of 28) is naively traditional. Thus: "Since, by definition [a need] is a process which follows a stimulus and precedes the actonal [motor] response, it must be located in the brain" (p. 45). Similarly, on many pages drives, directional forces, storage effects of experience, and so on are ascribed to the brain with no evidence other than an inferential "it must be" which is patently based upon tradition.

Limitation of space prohibits adequate reference to the many excellent ideas and hypotheses proposed in this volume—likewise to the unfinished and neglected possibilities. There can be no doubt that this is an important book. An original method of investigation is clearly outlined. While there is a definite psychoanalytic bias the authors have considered other methods (even statistical). That Dr. Murray does not consider his work final is indicated in the good advice of the book's last paragraph: "The general procedure that has been outlined—modified to suit conditions—may be feasibly carried out by any department of psychology or by any clinic that can bring together six or more competent examiners and gain the co-operation of a sufficient number of subjects or patients. If this were done systematically for a few years at several different centres, psychology would soon have at its disposal a large assemblage of facts to build a foundation for personology and to direct attention to the most profitable problems for research" (p. 741–2).

C. M. Louttit,
Indiana University

M. E. Frampton and H. G. Rowell, editors. *Education of the Handicapped.* Volume I, History. Yonkers, World Book Co., 1938. Pp. xii + 260.

The history of any subject is of value and interest because of the perspective it gives on current activities in that field. The present volume is intended to afford the material for such perspective in the field of education and care of the handicapped. There are sixteen contributors listed, with Drs. Frampton and Rowell as editors; however, there are only

two cases where the contributions of the sixteen are indicated. The chapter on the socially handicapped, *i.e.*, delinquents and criminals, attributed to Dr. Sanford Bates, is by all odds the most coherent one, but it does not say very much about the history of the care of this group. Authorship of one other chapter, that on the crippled by Miss Romaine Prior, is indicated, and this chapter seems to be the best historical presentation of any. All of the other chapters, dealing with the visual, auditory, speech, low vitality, and mentally handicapped read like seminar papers of graduate students. Much emphasis is placed on naming men, usually with a date (no indication whether it is birth, death, or publication) and usually very little exposition of just what their contribution was.

Because of complete lack of historical studies in this field, this book has some significance even though it is very badly done. There is almost a complete lack of reference to the secondary sources which were obviously used, or to the work of the men referred to. There is a bibliography of some twenty pages which should prove useful to the teachers. It is unfortunate that the editors did not produce a real history of this new area instead of this very elementary work.

C. M. Louttit,
Indiana University

E. C. Webster. *Guidance for the High School Pupil, a Study of Quebec Secondary Schools.* McGill University, Montreal, 1939, 153 pp. $1.75.

William D. Tait, in the foreword to this book, says, "In a word, intelligent discrimination and selection is the very foundation of all democratic education, and the only one fit to do this is the qualified psychologist, for only he possesses the technical skill in mental measurements as they exist today." This book is one of the better recent contributions which show the place of the psychologist in education, the need for more complete understanding of his services and abilities, and the possibilities of more effective education.

The systematic and careful research conducted by Mr. Webster over a period of five years had a two-fold purpose. First, it was to investigate the possibilities of organizing vocational and educational guidance at the earliest high school ages in Protestant schools of the City of Montreal. Second, it was to investigate the relationship between measures of psychological abilities, and (a) formal school training, (b) the choice of optional school subjects, (c) the chances of an individual's success in various occupations, and (d) the choice of occupation by new entrants to the labor market.

Twelve distinct groups of pupils, totalling 2853, were investigated. Eight of these groups were recruited in the three secondary schools in Montreal used in the study, one from the eleven elementary schools in

Montreal, one from the ranks of unemployed English-speaking youth, one from the graduates of various secondary schools in Montreal, and one from a small industrial city in the province. These groups are sufficiently varied and well enough controlled to make the findings concerning them quite illuminating in indicating the general trends of education in Montreal, as well as the problems confronting vocational guidance there.

Four principal techniques were used in this research. First, was the testing. An intelligence measure was obtained for every student; variations in giving such tests as reading and arithmetic achievement, English usage, spelling, literature, French, clerical ability, mechanical ability, and geometry and Latin "prognostic tests," were employed in order to give special consideration to many problems.

Second, information concerning the social and school backgrounds of the subjects was obtained through questionnaires, interviews, and school marks.

Third, the analyzation of the raw data included that which concerned pupils taking various courses of study. This indicated the typical characteristics of pupils following each course of study.

Fourth, the factors which lead to high school success in the various courses of study were determined by (1) making statistical comparisons between psychological tests and school marks, (2) comparing the scores of successful and unsuccessful students on the various tests, and (3) comparing successful students in various courses.

The author recognizes that all factors influencing success cannot be measured, and points out this and other limitations of the study. His treatment of the vast amount of statistical data is logical, and his emphases and interpretations are impartial. Concluding parts of it are easily read by the layman, while the treatment of his data must be recognized by the educator or psychologist as being sound and practical. He answers the vital questions concerning education and guidance partly in terms of the school system, and partly in terms of individual differences in boys and girls themselves. The focus of this particular book is on pupils of high-school age and on the Quebec school system, but its implications extend to the whole field of education, vocational guidance, and the labor market.

DOROTHY C. REECE,
Ohio University

Radio in Education. Department of Public Instruction, Commonwealth of Pennsylvania, Harrisburg, 1939, 47 pp.

The Department of Public Instruction of Pennsylvania conceived this bulletin as a means of introducing Pennsylvania's teachers to the development of the radio in schools, of relating interesting experiments, and

of speculating upon the future possibilities of radio and television as educational media. The bulletin was prepared by John F. Hausmann, Jr., and is one of a series of publications by the Federal Writers Project in Pennsylvania.

Mr. Hausmann has used a sizeable and well-selected bibliography. He discusses the background of radio, problems of educational broadcasts, and plans for the future of educational broadcasting, tracing particularly the development and participation of the various governmental agencies concerned with this phase of radio.

With the advent of commercial broadcasting stations in 1920 educational broadcasting began. In these early years some state universities sponsored experimental stations, loud speaker systems were installed to broadcast lectures to various classrooms, radio programs were prepared and presented by educational institutions, and courses of study were being conducted by radio. The success of the widespread and varied types of utilization of the radio by educators proved its value as an educational tool. In 1930 the National Committee on Education by Radio was formed under the supervision of the United States Office of Education; in 1931 the American Association for Adult Education formed the National Advisory Council on Radio in Education. These two groups have worked for the settling of problems in educational broadcasting and have succeeded in establishing an effective procedure for progressive planning.

Among the chief problems of educational broadcasting are: (1) the selection and securing of time, (2) the preparation and presentation of good programs, (3) the need for satisfactory cooperation between educators and broadcasters, (4) the necessity of audience preparation for educational programs, and (5) the need for building up listener response.

The analyzation of educational radio programs is important in the improvement of techniques in educational broadcasting. The National Committee on Education by Radio has selected five "guideposts" as requirements of educational programs: (1) the program must have unity; (2) the subject matter selected must be educationally important; (3) the program must induce a considerable proportion of the listeners to explore the subject more thoroughly; (4) the major points should be summarized at the close of the program; and (5) the material should arouse the listeners' "voluntary" interest.

The general types of broadcasts advocated for educational programs are: (1) talks, (2) directed activities, (3) actuality or news broadcasts, (4) radio conversations, (5) debates, (6) music, and (7) plays. Every educator, in planning programs, should select the best type of program, choose the best possible adaptation of the subject to the program-type, be familiar with proper techniques of preparation and production, and completely analyze the program before and after presentation.

Among the plans for the future of education by radio is the experiment being conducted in two selected regions of our country in attempting to develop a procedure which will consider the requirements both of public and private agencies interested in education by radio. It is hoped that the measures adopted in these regions by the National Committee on Education by Radio may be nationally applied.

The Office of Education is acting as a coordinator in the development of radio education by: (1) sponsoring the Federal Radio Education Committee, (2) assembling all available television material, (3) developing education radio producing groups, (4) furthering cooperation between educators and broadcasters, (5) furthering experimentation and demonstration in educational radio, (6) developing practical training facilities for educators, (7) establishing short-wave stations in schools, and (8) securing more adequate support for existing educational radio stations.

The combined efforts of all the groups interested in education by radio have and will contribute to the development of this factor as an educational tool, for we have only begun to utilize and develop this aid to learning.

DOROTHY C. REECE,
Ohio University

NEW BOOKS AND PAMPHLETS

Books and pamphlets for review should be sent to JAMES P. PORTER, *Editor*, JOURNAL OF APPLIED PSYCHOLOGY, Ohio University, Athens, Ohio.

The Carnegie Foundation for the Advancement of Teaching. *Studies in Early Graduate Education.* Bulletin No. 30. W. CARSON RYAN. The Carnegie Foundation for the Advancement of Teaching, 522 Fifth Avenue, New York City, 1939. 167 pp.

Directing Learning by Teacher-Made Tests. RUSSELL T. PURNELL AND ROBERT A. DAVIS. Bureau of Publications, Extension Divi[illegible], University of Colorado, Boulder, 1939. 92 pp.

Elements of Statistical Reasoning. ALAN E. TRELOAR. John Wiley & Sons, New York, 1939. $3.25. 261 pp.

An Experimental Study of the Perceptibility and Spacing of Music Symbols. LORIN F. WHEELWRIGHT. Bureau of Publications, Teachers College, Columbia University, New York, 1939. $1.85. 116 pp.

Management and the Worker. F. J. ROETHLISBERGER. Harvard University Press, Cambridge, Mass., 1939. $4.50. 615 pp.

A Manual of Fraternity Week Talks. CARROLL S. GEDDES, Advisor, Interfraternity Council, and others. Interfraternity Council, University of Minnesota, Minneapolis, Minn., 1939. $1.00. 108 pp.

Minor Mental Maladjustments in Normal People. J. E. WALLACE WALLIN. Duke University Press, Durham, N. C., 1939. $3.00. 298 pp.

Neurobiologia, June, 1939. DIRECTOR, PROF. ULYSSES PERNAMBUCANO. Recife, Pernambuco, Brazil. 192 pp.

Psychology of Child Behavior. ARNE S. JENSEN. Prentice-Hall, New York, 1938. $3.85. 664 pp.

Textbook of Abnormal Psychology—Second Edition. ROY M. DORCUS AND G. WILSON SHAFFER. Williams & Wilkins Company, Baltimore, Md., 1939. $4.00. 475 pp.

Directory of American Psychological Periodicals

(Continued)

Journal of Comparative Psychology—Baltimore: The Williams & Wilkins Co. Subscription $5.00 per volume of 450 pages. Two volumes every year. Edited by Knight Dunlap and Robert M. Yerkes. Founded 1921.

Comparative Psychology Monographs—Baltimore: Johns Hopkins University Press. Subscription $5.00. 400 pages per volume. Knight Dunlap, Managing Editor. Published without fixed dates, each number a single research. Founded 1922.

Genetic Psychology Monographs—Provincetown, Mass.: The Journal Press. Subscription $7.00 per volume. One volume per year. Edited by Carl Murchison and an international cooperating board. Quarterly. Each number one complete research. Child behavior, animal behavior and comparative psychology. Founded 1925.

Psychological Abstracts—Ohio State University, Columbus, Ohio: American Psychological Association. Subscription $7.00 a year ($7.25 foreign). 700 pages ann. Edited by W. S. Hunter. Monthly. Abstracts of psychological literature. Founded 1927.

Journal of Genetic Psychology—Provincetown, Mass.: The Journal Press. Subscription $14.00 per annum; $7.00 per volume. 1,000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Child behavior, animal behavior, and comparative psychology. Founded 1891.

Journal of Social Psychology—Provincetown, Mass.: The Journal Press. Subscription $7.00. 500–600 pages annually. Edited by John Dewey, Carl Murchison, and an international cooperating board. Quarterly. Political, racial, and differential psychology. Founded 1929.

Personnel Journal—New York: The Personnel Research Federation. Subscription $5.00. 400 pages. Edited by Charles S. Slocombe. Published monthly, except July and August.

Mental Measurement Monographs—Baltimore: The Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Knight Dunlap and Buford Johnson. Published without fixed dates, each number a single research. Founded 1925.

Studies in Psychology and Psychiatry—Baltimore: The Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Edward A. Pace. Published without fixed dates, each number a single research. Founded 1926.

Journal of Educational Psychology—Baltimore, Md.: Warwick & York. Subscription $6.00. Edited by Jack W. Dunlap, Harold E. Jones, and Percival M. Symonds. Published monthly except June to August. Founded 1910.

Child Development—Baltimore, Md.: Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Buford Johnson. Quarterly. Founded 1930.

Character and Personality—Durham, N. C.: Duke University Press. Subscription $2.00 per annum. Quarterly. Published simultaneously in Great Britain and the United States. Edited by Charles E. Spearman (London) and Karl Zener (Duke University). Founded 1932.

Journal of Psychology—Provincetown, Mass.: The Journal Press. Subscription $14.00 per annum; $7.00 per volume. 1000–1200 pages annually. Immediate publication for any accepted manuscript. Edited by Carl Murchison and an editorial board. Quarterly. The general field of psychology. Founded 1935.

Directory of American Psychological Periodicals

American Journal of Psychology—Ithaca, N. Y.: Cornell University. Subscription $5.00 and upon annually. Edited by E. B. Titchener, H. Delabarre, M. F. Washburn, K. Dunlap, E. G. Boring. Original and expert matter in psychology. Founded 1887.

Journal of General Psychology—Provincetown, Mass.: The Journal Press. Subscription $10.00 per annum; $2.00 per volume. 1000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Experimental, theoretical, general, and historical psychology. Founded 1928.

Psychological Review—Ohio State University, Columbus, Ohio: Psychological Review Company. Subscription $5.50 (Canada, $5.75). Single copies, $1.00. 640 pages annually. Bi-monthly. Original contributions only. Edited by Howard C. Warren. Founded 1894.

Psychological Monographs—Ohio State University, Columbus, Ohio: Psychological Review Company. Subscription $6.00 per volume of about 500 pages. Edited by [illegible]. Published irregularly, each issue one or more researches. Founded 1895.

Psychological Index—Ohio State University, Columbus, Ohio: Psychological Review Company. Subscription $4.00. [illegible] pp. Edited by W. S. Hunter and [illegible] Willoughby. An annual bibliography of psychological literature. Founded 1895.

Psychological Bulletin—Ohio State University, Columbus, Ohio: Psychological Review Company. Subscription $6.00. [illegible] pages annually. Psychological literature [illegible] (10 numbers). Edited by John A. McGeoch. Founded 1904.

Archives of Psychology—New York: Columbia University. Subscription $6.00. [illegible] vols. Edited by R. S. Woodworth. Publication without fixed dates, each number a single experimental study. Founded 1906.

Journal of Abnormal and Social Psychology—Ohio State University, Columbus, Ohio: American Psychological Association. Subscription $5.00. Foreign, $5.25. Edited by Morton W. Allport. Quarterly. 500 pages annually. Abnormal and social. Founded 1906.

Psychological Clinic—Philadelphia: Psychological Clinic Press. Subscription $2.00. [illegible] vol. by Lightner Witmer. Numbers issued fixed dates (Quarterly). Abnormal psychology, hygiene. Founded 1907.

Psychoanalytic Review—Washington, D. C.: [illegible] 10th St., N.W. Subscription $5.00. 500 pages annually. Psychoanalysis. Quarterly. Ed. by W. A. White and S. E. Jelliffe. Founded 1913.

Journal of Experimental Psychology—Ohio State University, Columbus, Ohio. Monthly; two volumes per year, each volume of six numbers containing about 600 pages. Experimental. Subscription $10.00 ($7.00 per volume). Edited by [illegible] Weisenburger. Founded 1916.

Journal of Applied Psychology—Lancaster, Pa.: Science Press Printing Co. Subscriptions $5.00. [illegible] pages annually. Bi-monthly. Edited by James P. Porter, Ohio University, Athens, Ohio. Founded 1917.

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